American Machinist

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WHAT WILL YOUR INVENTORY SHOW ?

Chester B. Lord
Associate Editor

Mass, or repetitive, manufacture conserves time at the expense of material; but even in efficient factories, the value of an inventory is much larger than it should be, because its items are not balanced in terms of complete devices. The only way to do this is to show how long its items will last at the schedule rate—i.e. how much is available

WITH all the literature on inventory and all the discussion of the literature, there should be nothing left to say upon the subject. But the same confusion, the same uncertainty about magnitude and pricing prevails today that prevailed prior to 1923. It is true that the lesson in "frozen" inventories has led to somewhat smaller inventories, but it has not clarified the situation at all. The size of an inventory is still largely a matter of personal opinion and a variable, whereas it should be a principle and a constant.

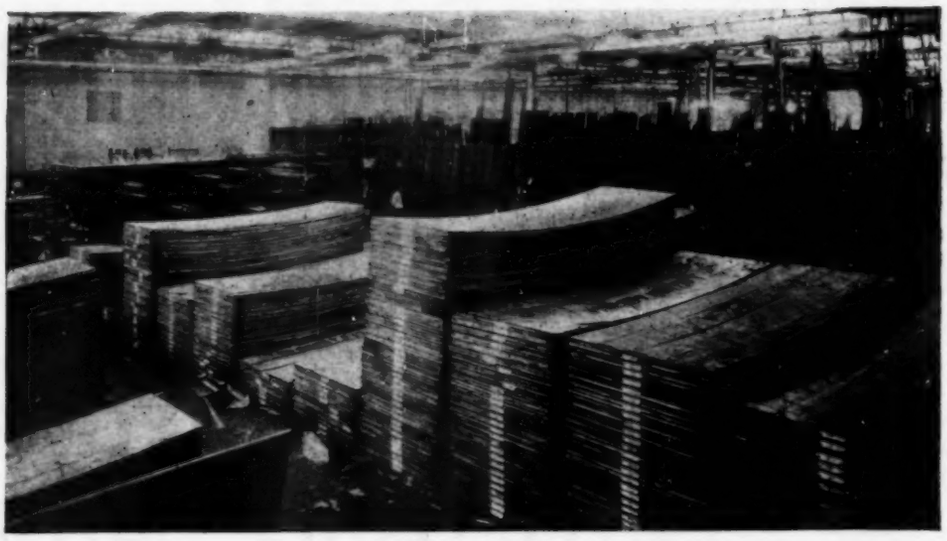
The cause of this confusion is twofold: first, the opinion that mass or repetitive, and contract or intermittent manufacture are merely two variations of the same thing, whereas they are fundamentally different, and require radically different control methods; second, each type of material control, as now used, lacks the one essential factor that will balance the one and reduce the other. Just as the introduction of the "available" factor into material control marked the difference between guesswork and accuracy, so does "balance of inventory" in the one case and "time necessary to consume" in the other, mark the difference between the same two things in repetitive and intermittent material control respectively. Some concerns talk of "balance," some possibly have it, but if so, it must be expressed in terms of time-output, and not in terms of quantity.

The inventory of the mass or repetitive type of manufacture may be made a constant by dividing it into its constituent parts, operating and replacement material, and by basing the first on minimum economic manufacturing quantities, and the latter on sales output.

Mass or repetitive manufacture is directly analogous to the operations of a water system in a small town. First a standpipe is built, sufficiently tall to furnish the required pressure, and large enough in diameter to give continuous service without over-taxing the pump.

Contract, or intermittent, manufacture conserves material at the expense of time. Its inventory value is not a comparable factor, and many items are likely to be doubtful assets. There can scarcely be such a thing as balance. The vital factor is "time necessary to use," incorporated as a purchasing policy, not a material record

The standpipe must be filled with operating material before any water is allowed to escape through the outlet. This water in the standpipe is a constant. Over a period of time it neither increases nor decreases. After the standpipe is filled to the desired level, the water that passes through bears no relation to the capacity of the standpipe, it merely passes through at a rate to satisfy sales demand. The function of the pump is to replace what has been sold and to maintain the level of the operating material. The same is true of a repetitive-type factory. It must first be filled with operating material based upon the same factors that control the height and size of the standpipe: time and output. As long as the same general rate of output is maintained, this operating material is a constant. The material that passes through the factory is to satisfy sales demand, and if replacement is based upon output it becomes automatic; it neither increases nor decreases the operating



There can be no objection to an executive exercise of judgment as to the size of an inventory, provided the size is forecast

material, because it exactly equals the output, as in the case of the water in the standpipe. Carrying the comparison another step, neither the water company nor the factory derives any revenue from operating material. It is an expense as long as the company operates.

A few years ago I was asked to analyze the inventory statement of a prosperous plant that manufactures a line of internationally known implements. The plant in question manufactures quality articles, and I consider its efficiency of management far above the average. Its general manager is, or was, a certified accountant, and being of New England extraction he practices industrial economy. The plant is not unduly large; the staff is sufficient to give close attention to details. Any shortcomings of management must therefore be laid to blindness and not to ignorance or lack of time.

The total inventory in the year in question was $600,000. Of this, $200,000 was in process material and $400,000 in rough material. The first was operating and the latter replacement material. Sales for the year had been $1,500,000. In answer to a suggestion that it was much too large, the general manager made the usual statement that the size of an inventory was a matter of opinion, and because of the multiplicity of devices they manufactured and the quick deliveries they were required to make, the rough stores inventory was justifiable on a basis of $1,500,000 sales. As a matter of fact it makes no difference, broadly speaking, whether one be manufacturing a single thing continuously, or several things intermittently, provided they are manufactured in economic manufacturing quantities and the same devices recur. There may be some loss because of set-ups, etc., but that does not affect material quantities. A large inventory is necessary only because of its unbalance and because it is only usable in part.

There can be no objection to an executive exercise of judgment as to the size of an inventory, provided the size is forecast and is not the result of uncontrolled circumstances. The criterion that many executives use as a guide to the permissible size of an inventory is its relation to sales for the year. This comparison means absolutely nothing for three reasons: first, there is no relation between yearly sales and economic manufacturing quantities; second, inventory is, or should be, a constant based upon the operations of the shop; and third, if another reason is needed, because the size of an inventory is secondary to its balance.

Vaguely, in the background, is the idea that the purpose of taking an inventory is to determine the balance of material, but because the mind cannot carry and compare an almost infinite number of items and quantities, and because there is no general method of visualizing an inventory in terms of balance, this function is usually confined to a few items that are obviously excessive. The efficient factory operates with the smallest inventory that will serve its purpose, but from an investment standpoint, the value of the inventory is usually several times as large as it should be, because of its unbalance.

When I said that a controlled inventory was justifiably a matter of opinion, I had in mind balance and not quantity. If an inventory is in balance its volume may be taken care of automatically.

Operating material, or material in process, is, or should be, a constant like the water in the standpipe. For that reason, it cannot be counted in any turnover, nor can it be compared with either replacement material or with sales. It is not a liquid asset, it is an equipment expense, convertible at its original value when the operation is concluded. It is included in an estimate of capital turnover, but as a matter of fact it does not turn over, it remains constant, only the replacement material turns over, and that in direct proportion to sales.

Replacement material, on the other hand, can be compared with sales, but only in terms of turnover periods —in the implement plant roughly three months. Inventory, therefore, in this article should be considered as rough material only. The operating, or in process material, will be ignored. I am also proportionately reducing the actual figures of the inventory so that no one will say, "We would never have such a big inventory," and also to illustrate what happens with even a moderate one.

If we are to compare sales and inventory we must add those things to inventory material that are included in sales material. The direct labor cost in the type of product made by this concern was equal to the material cost. The overhead, administrative expense, and profit made the ratio of raw material cost to sales price about 1 to 4. An investigation into costs of somewhat similar concerns shows this ratio to be conservative. This, then, places the sales value of the $400,000 inventory at $1,600,000. If statistics were usable, this firm would have enough material to last it for more than a year.

The figures I have given, however, are comparable

to sales in value alone. To be truly comparable they must both be placed on the same time basis. The material replacement period of the company is three months. This means that economic manufacturing quantities justified them in purchasing material and manufacturing a three months' supply of parts at the average sales rate. If, therefore, we base our comparison on the replacement period, of three months, we must divide our sales by four. The sales for three months were $375,000, and at the ratio of one to four, this would require $93,000 worth of raw material, whereas we have more than four times that amount, or, when evaluated at sales prices, $1,600,000 against $375,000 sales for the same period.

The worst, however, is still to come. When we make comparison in terms of balance of parts, which means material in inventory, in process, and on order—the only accurate comparison—we find the following:

Assuming that the $400,000 worth of raw material is sufficient for 100,000 complete appliances that require some 5,000 different parts, we find that material can be sent into the shop in economic manufacturing lots for 30 per cent, or enough for 30,000 complete appliances of different kinds. This uses up $120,000 worth of material. The next 20 per cent is short of material for a percentage of parts. The shortages vary from 10 to 100 per cent. The remaining 50 per cent is an excess of parts above and beyond our requirement, with less than half of the items present. The surplus quantities cannot be matched with either of the other classes. It is conservative to say that the 20 per cent lot is 70 per cent complete, and the 50 per cent lot only 30 per cent complete, from a value standpoint. It is, then, necessary to spend $24,000 for material to make the 20 per cent lot usable in economic manufacturing quantities for complete appliances, and $140,000 to make the remainder usable, a total of $164,000. When we remember that our material cost for a year's sales of $1,500,000 is only $375,000 and we have already on hand enough for one year it seems a pity to spend $164,000 to balance our inventory, and then, probably about the same amount to unbalance it again. This is a lot of capital for a small concern.

THE shop man may ask, "Why worry? Why not go ahead with those lots which have sufficient parts on hand to machine in economic manufacturing lots and by that time other material will have been received?" There are two answers to this: "First material on order is included, and second, we are considering it in terms of investment value. Many bank loans, secured by inventory, are for the purpose of balancing that same inventory.

Some may not agree with the figures given. They may think that the inventory is still too high. It is, but it is the inventory of an efficient concern, more efficient, I believe, than most concerns of its size. It was laboring under the disadvantage of having a cumulative surplus of material used for making many different types of tools, but this is a condition met with in many industries and one that is constantly increasing as companies seek to diversify their lines. The contention is that it makes little or no difference whether the parts placed in production belong each to a different mechanism or are parts of one mechanism. The same kind of control, good or bad, gives the same kind of result in either case. An inventory is large because it is unbalanced.

In contract or intermittent type of manufacture, where material is conserved at the expense of time, quantity becomes the common denominator and there appears to be no way of establishing a time-value inventory constant that means anything. On some contracts the material cost is 90 per cent of the total, on others it is only 10 per cent. Economic manufacturing quantities mean nothing because they are not repetitive, and there is a gradual accumulation of unusable material.

THE factors that govern efficient inventory control in this type of manufacture are economic purchasing quantities, time necessary to procure, and time necessary to consume. The most economical combination of these three factors fixes the maximum and minimum stock quantities.

Intermittent or contract manufacturing is so fundamentally different from the other type that no comparison between the two occurs to me. The basis of one is to conserve time at the expense of material, of the other, to conserve material at the expense of time. The first step towards eliminating confusion is to recognize the duality caused by this fundamental difference.

The inventories of the two types of manufacture differ just as radically. The inventory of repetitive manufacture is generally an asset, it is used to indicate the efficiency of manufacturing on the basis of capital turnover, it is also the basis of a bank statement on which to borrow money. Compared with the output it offers a basis of comparison as to economy of management. The inventory of the intermittent or contract type of manufacture, on the contrary, has no justification. It may be largely a liability, it bears no relation to output, and its only basis of comparison is with the preceding inventory which means nothing. How then is it possible to take both indiscriminately as many factories do? And why will banks lend money on inventory statements when the state of the inventory itself may be the necessity for a loan?

A further proof of the difference between the two types of manufacturing is the fact that there can be no such thing as balance in intermittent manufacture. The factor that is missing from this type of inventory—or rather material control which precedes inventory—is "time necessary to consume last lot." Setting maximum and minimum quantities is of little value unless the time necessary to consume is the basis of ordering. To re-order just because the order point has been reached usually means perpetuating a mistake. Just as time, the basis of repetitive manufacture, must be checked by quantity, so must intermittent manufacture with its basis of quantity be checked by time. Only by two known factors can the third or unknown factor be found.

An inventory is supposed to show what the average quantity and value of the material on hand has been during the year, not what it happens to be on one particular day of the year. The practice of setting the stage by reducing stock two months preceding inventory I consider neither ethical nor wise; unethical because it attempts to correct artificially an unsatisfactory condition that has persisted throughout the year and will occur again after the inventory period; unwise because it does not pay to fool ourselves. The perpetual inventory method was designed to remedy the first condition, and in some places it is a partial remedy.

In mass production we are not interested in our inventory quantities. We are interested in knowing how many weeks' supply of balanced material we have at the

manufacturing rate. It means nothing to show 9,881 pieces of a certain part, and 4,222 of another, but when the records show that 9,880 parts will last 10 weeks at sales rate, and 4,222 parts will last 42 weeks, the contrast is accurate and effective. If the inventory records are set up on a time basis, shortages, excesses, and unbalance are readily observable. The time basis shows actual condition; the quantity basis confuses. Balance does not mean that an equal number of sets of parts must be physically present in stock at all times, but it does mean a balance of parts in stores, in process, and on order.

Where this methods has been set up and the actual inventory visualized it has been found almost invariably that only about 30 per cent of the rough material was available in *economic manufacturing quantities* to manufacture *complete* units or apparatus. The finished material was equally unbalanced, but economic lots did not enter. Of the remainder about 20 per cent had one or more items entirely missing or there was considerably less than an economic machining lot, as in the implement plant. The other 50 per cent showed large excesses of various parts left over after the other lots had been separated. This is a general condition.

IN most plants where the inventory was visualized, efficiency of operation was above the average, and the difference between these plants and others is merely that the former knew the condition of their inventories and the others did not. Failure to know, however, is no reproach, because inventories are not usually visualized, and from the shop point of view it is better to have an overstock than a deficiency.

The natural question that occurs to the shop man is: what difference does it make, anyway when the processes are continuous and we will use any surplus sometime? The answer is this: during the first few months after inventory, most of the money spent in the average shop is for material to balance the inventory, and during the succeeding months much of the money spent goes toward unbalancing it. In the end we will have tied up possibly several times the proper amount of capital.

The same conditions that confront the continuous-type manufactory ensnarl the intermittent type. But there is one essential difference between the type that saves time at the expense of material, and the one that does the reverse. To illustrate this, I will take as an example another up-to-date plant with an efficient management. That is, efficient by the usual standards.

This firm used fewer than fifty items of material in its business. It manufactured entirely on order; some of its line was standard; much of it was special. The nature of its raw material was such that it purchased in large quantities, and it had been stung so badly in the 1923 "freeze-up" that it had taken extraordinary precautions against a repetition. It kept a perpetual inventory, not by month or week, but daily. Each morning there was laid upon the desk of the secretary of the company a statement showing the material on hand at the close of business the day before. It differed from bank procedure only in that, if an item did not check out, the employees were not kept at work until it was accounted for.

The secretary was one of the penny-watching kind, as good secretaries and controllers should be. This particular secretary was also a stockholder in the company. He had been rather badly hit in the freeze-up and was determined that such a thing should not recur. Here then was the setting for perfect inventory control: efficient management, few items, daily check-up, and a competent stockholder doing the purchasing.

I have before me one of the daily inventory sheets and also an analysis I made of it in terms of the three factors, economic purchase quantities, time necessary to procure, and time necessary to consume. The information in each case was supplied by the men interested. If it is at all partial, it leans in the direction of liberality.

Under the best of conditions, the inventory was bound to be heavy, because some of it was purchased in carload lots, but the greatest factor contributing to overstocking was the universal practice of basing inventory value on sales instead of upon the analyzed necessities of each item.

The first twenty items on the inventory sheet are typical of the whole, and will be used to save space and figuring. The records for eleven months were available for compiling averages, and the different items were all in pounds. The computation shows that material in stores covering a period of eleven months averaged 736,577 unit-lb. for the twenty items. The average material used during a period of four weeks in the same eleven months was 298,756 unit-lb. These terms are not comparable because the first item is a matter of quantity alone and the second is a matter of quantity-time, but it is this same mix-up that confuses management; it gives an idea but not an answer.

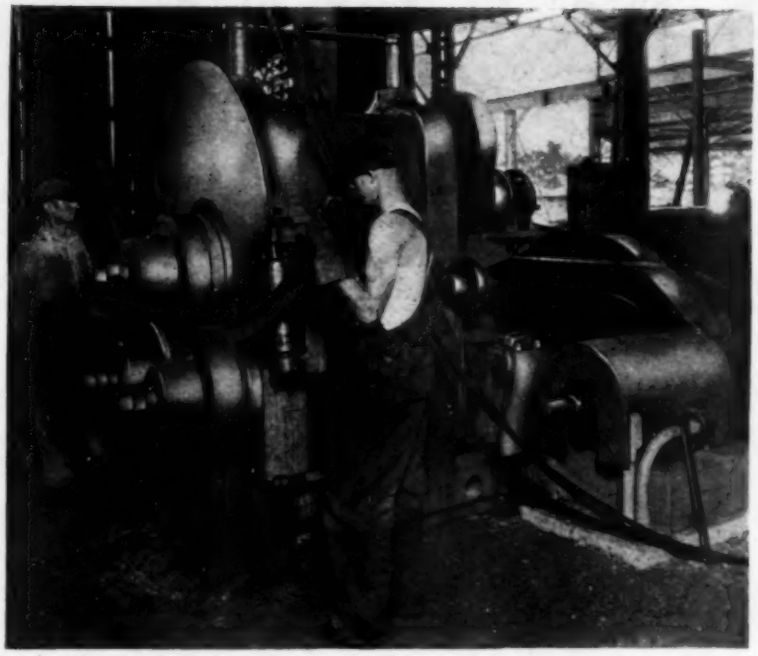
An investigation of supply sources showed that only four items out of the twenty required more than two weeks to procure.

Under the three-factor-method I have outlined, the average inventory was cut to a maximum of 490,000 unit-lb., a difference of 246,427 unit-lb. from the average. The turnover period was based on four weeks supply, with one or two exceptions which were longer. This was a factor of safety of almost 100 per cent. It would, of course, have been possible to figure the saving in capital investment in money value, but why rub it in? Inventory value in this case is of no point whatever. It may show the purchase value of the material, but it does not usually tell whether it is standard or was purchased for a specific order, what its chances of future use are, how long it has been in stock, or what its real sales value is. And still banks lend money upon such inventories.

The only salvation of the contract type of manufacture is to check purchase quantities against time necessary to consume, and thus automatically control inventory. This cannot be done as part of the stock record. It must be made a definite part of the purchasing function.

EVEN if the controller had been correct in his belief that his maximum and minimum quantities were correct, he was still in trouble, because his records contained no mention of sales orders. No data were kept on a basis of time necessary to consume or time necessary to sell. The result was that, when short of work, the factory made up material for stock, not based upon sales requirements, but upon the idle machine necessities of the moment. Packed stock contained material that would not be used, in one or two instances, for five years. Thus may one watch pennies and lose dollars, not through ignorance, but through blindness.

In the light of these two instances and several others I could furnish, I ask again, "What will your inventory really show?"

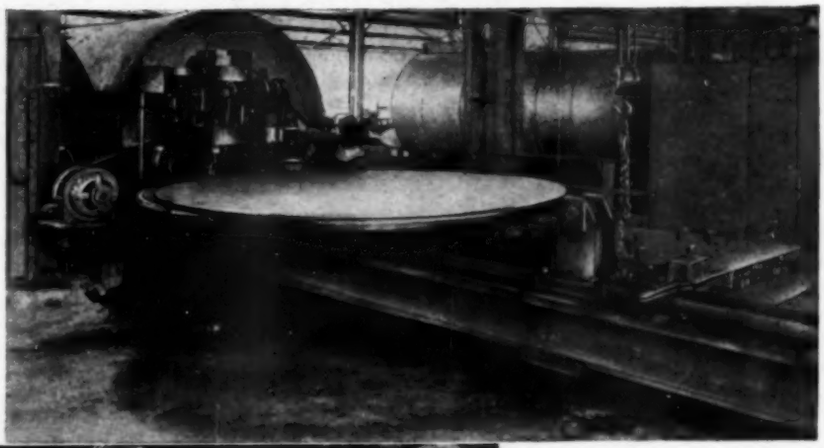


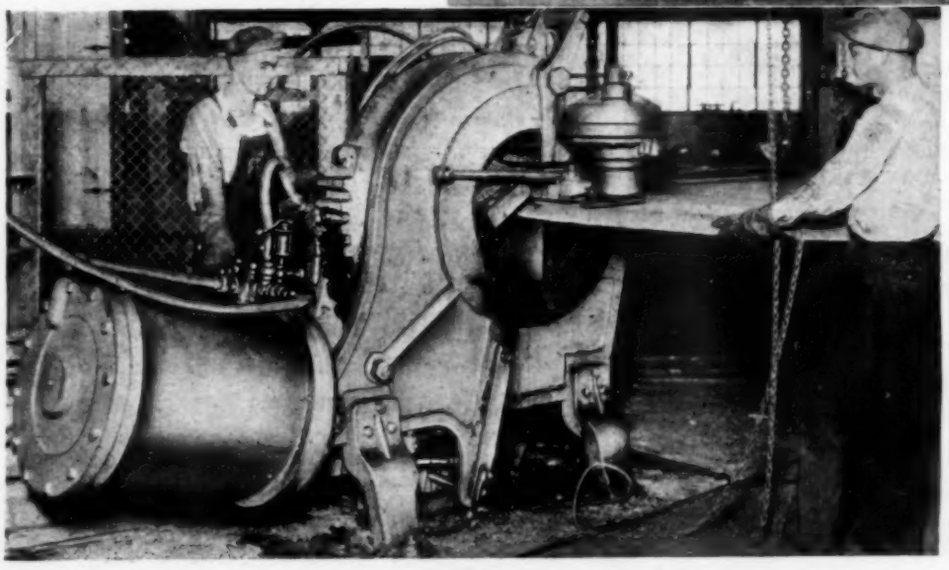
Included in the machine equipment of the new plant of the Wyatt Metal & Boiler Works at Houston, Texas, is this Ryerson angle-bending roll with a capacity of 6x6x½-in. angle cold. A welder may be seen at work in the background, the motor covers on the bender testifying to his ability

Photographs courtesy General Electric Company

Fabricating Tanks in the Lone Star State

In making tanks up to 12 ft. in diameter and 36 ft. long, unusually large and heavy plates must be handled. At the right is a tank head cutting and flanging machine for stock up to ½ in. thick. Some of the finished tanks may be seen in the background in the assembly bay, serviced by both jib and bridge cranes





A McCabe pneumatic flanging machine for cold-flanging heads up to ¾ in. thick. Most of the other units are individually motor driven, permitting easy rearrangement. Motor controls are full magnetic

EXECUTIVE FORUM

Is Propaganda Profitable?

ARTHUR HEMPALL laid down the newspaper he had been reading in the lounge of the Engineers Club.

"I'm getting fed up with some of these yarns about the high salaries of movie actors, trial lawyers, and ball players," he said to Bill Holland, who sat next to him.

"Why worry?" asked Bill. "They're interesting if true, and do no particular harm in any event."

"I'm not so sure," said Hempall. "It wouldn't be so bad if these stories were consistent, but when they tell about industry, it's always the minimum wage that receives the publicity. The small pay the movie extras get is overlooked. So are the struggling lawyers who have to collect bills to get enough to live on. But when shops are discussed, only the hiring rate receives any notice. Why I know two mechanics in Worcester each earning $100 a week, and they haven't been idle this year. I don't see them mentioned in the papers."

"Outside of some slight injury to your professional pride, what difference does it make?" asked Bill.

"For one thing, the exaggerated accounts are likely to make industrial workers discontented with their lot. They read about a few high salaries, and don't realize that most ball players are through at thirty-five and that most prize fighters get more bruises than bonds. Then there is the effect on the public—it gets the impression that industrial employees are underpaid and exploited."

"These other lines of work incite the imagination more readily and naturally receive more attention. What remedy would you suggest?"

"Publicity, propaganda, or whatever you want to call it," said Hempall. "Let it be known that many shopmen are making good wages and are enjoying a high living standard. The metal-working industry should have a good publicity counsellor to put the idea across—a mechanical Judge Landis. The telephone companies appreciated this years ago and deliberately set out to build public good will. The gas and electric companies are waking up to the need for similar action."

"Those companies serve the public," said Bill. "They are dependent on legislation for their rates, and in the final analysis, legislation is based on public sentiment. Good will is highly important in baseball and the moving picture industry. But metal-working plants are in a different class—many of them have little contact with the general public. The creation of good will is a costly process, and I can't see how it would benefit the majority of industrial plants."

"For such concerns sound public relations have a value that is less tangible but none the less important," said Hempall. "In labor disputes and similar controversies, public sentiment often casts the deciding vote. The cotton mills got Walker D. Hines to head their organization for somewhat the same reason. No industry can afford to ignore the influence of public esteem."

"How does talking about high wages help matters?" asked Bill.

"That's only one angle of it," said Hempall. "The steel companies felt the public's point of view when the move for a shorter working day in the mills started. Now the steel industry recognizes the importance of this influence."

"But I don't see that it helps the cause to advertise Eugene G. Grace's million-and-a-half-dollar bonus," said Bill.

Suggested by A. W. Forbes,
Forbes & Myers.

What Do You Think About This Problem?

Public utilities and other company groups that serve the ultimate consumer have found it advantageous to promote systematically general good will. Is it advisable for other industries not as close to public reactions to follow the same policy? Favorable sentiment is of course an asset to any concern. But is it wise for the metal-working industry, for example, to finance a move solely for the purpose of creating this sentiment?

. . . Discussion
of Executive Problems

■

The Fewer the Higher

Any company manufacturing tools, machines, or other products which necessitate supplying customers with future replacement parts would do well to go further into the question of costs than just to calculate roughly. The accounts should analyze past performance figures, drawing up frequency curves showing the costs of various size lots for a number of representative parts. This work can be done by an accounting clerk in odd moments at little expense. A study of a number of these curves would show a very definite correlation as to the per cent of set-up time to operating time on various types of jobs. The percentages would then be explained in detail to those who would make estimates and would be used to calculate all jobs.

It should be noted here that costs so estimated would not always reflect the actual cost of each job, but such a method gives a fairer price to all. With parts priced on an average cost basis there are several distinct advantages:

1. The overall return on the manufacture of repairs would more nearly reflect the true costs.

2. Estimates would cost less to make and could be furnished more quickly.

3. It would be much easier to "sell" the costs to the purchaser because they would be more uniform and more nearly conform to the utility value of the parts. Those which could be made efficiently would absorb the peak costs of those whose costs would otherwise be extreme and hard to justify.

It is not correct to use the general departmental overhead figures, calculated for production work, on such jobs. Modern shops, large enough, have found it more economical to have special small lot repairs handled in a special shop separated from production work. This, of course, cannot always be proved in. The burden should be broken down into its various factors when it will be noted that the burden to be charged to these special jobs should be much higher than that on regular production work. This is true because more supervision is required, more tools and gages are drawn from the tool room and returned, the percentage of loss through breakage and grinding special tool bits is greater.

—ALLAN R. MACLAGAN.

Square Deal or New Deal?

There should be no middle ground for shop executives. They should pull for their superiors and for the organization 100 per cent or be replaced. When an executive, such as a works manager, is hired from the outside, it is generally an indication that there is not an executive within the organization to fill that position. If the subordinate executives do not realize this, and pull with their new chief, they should be replaced with men who will be loyal.

Before hiring a new works manager, the possibility of a wholesale house-cleaning has been considered and would meet the approval of the senior executive. A works manager is not brought into an organization unless there are weaknesses within it that need correcting, and it is his duty to uncover these weaknesses and correct them.

The tendency among old men is to stick together, quite often to the extent of being disloyal to a new superior. The new executive would do well to keep his weather eye open for this, and set an example by letting out the first offender. If he takes this step and the old boys learn early that they must be loyal in order to hold their jobs, they will be ready to step in line and be of real value to their organization.

—C. F. STAPLES.

Anticipation Without Realization

After an employee gives a company ten or more years of his service, he surely must deserve being called an integral part of the organization, for had not his service been useful, he surely would not have lasted that long. No doubt, during those years of service, he gave the company the best he had or the best that was expected of him. Oftentimes the position he holds does not permit him to earn a higher salary, yet his employer expresses his gratitude and appreciation.

The intrinsic value of a bonus is based upon the sentimental feeling between the parties concerned. It may serve as a bond to strengthen the feeling of friendship after years of association. As soon as the sentimental value is lost or is deposed by the pecuniary value, the yearly bonus is no longer a gift of appreciation, but an evil habit.

—ANTHONY PAPA,
Reliable Tool Company.

The Urge to Merge

Merger enthusiasts present their pictures, advantages, and benefits that accrue to the public. They declare that large combines sell their goods more cheaply, that the quality is of the best, that they give employment to thousands. They cite cases in which controlling companies have built homes, streets, roads, and even small cities for their employees. True enough; but what is the real reason for mergers? And what will be the far-reaching effect of it all? Interview the head of any new merger, and ask him for the underlying principle. Maybe he will tell you that it was organized for the benefit of mankind; that the making of profits is of no particular moment; that he yearns to manufacture and sell goods at a figure within the reach of everyone's pocketbook; that he seeks to create opportunity for youth, employment for the middle-aged, and pensions for the old.

There are two garages on an intersection of two main streets. Both businesses are giving good service; each enjoys a good trade, but they watch each other like wild cats. If one takes a little more business this week

than his competitor, the under dog tries a scheme for inducing the major portion of trade to come his way; a lower price on brake lining or valve grinding will do it. Immediately, his neighbor matches the bid, and out goes another sign telling the same story, at a few cents lower. So it goes until one day they get together and decide to pool their interests. That eliminates competition, strengthens their finances, prevents price cutting, and brings an all around better feeling toward each other. The customer is of secondary importance. Now, he pays the bill, and there are no competitive features to secure for him a lowered price. Mergers increase capitalization, throttle competition, and control a certain market to raise prices to a point where profits are guaranteed.

What is the effect on the working class? Thousands are placed upon one payroll, under one guiding head, instead of being on many individual payrolls. The president of the merged concern is always a financial wizard. He knows markets, has his finger on the blood-stream of trade at all times, is in close touch with business conditions everywhere, has hourly reports laid upon his desk. Almost before anyone knows that a depression in trade is imminent, he is arranging to cut his forces. And when he does cut, it is thousands and not just a few. This was clearly shown in the wholesale lay-off of men within the last six months. This could never happen if they were divided far and wide, under many guiding hands.

How about the cheap prices, from which the general public so handsomely profits? Delving deeply, it will be found that the prices are higher or as high than those quoted by the independent merchant. Because of effective and flashy advertising, prices seem low. And you may rest assured that any competition is treading dangerous soil. Sooner or later, it will succumb.

Mergers create tremendous buying power and increase financial facilities, enabling the design and manufacture of labor-saving machinery. Mass production eliminates the necessity of skilled artisans, and makes it useless for young men to learn trades. So, the truth remains—united, we stand against the merger; divided, we fall in line, and for it.

—Raymond H. Dauterich,
The Crescent Engineering Company.

Wholesale or Retail?

I have never seen much good come of industrial plants going into retail business for the benefit of employees. Such experiments as I have seen along these lines have resulted in dissatisfaction to all concerned. The cost of ordering, storing, receiving, and selling is usually considerably in excess of the usual difference between the wholesale and retail prices. There is a definite loss in production because of the time consumed in ordering and receiving goods by employees during working hours. The employees find themselves in difficulties when they have well grounded complaints to make concerning the goods supplied. The sale has been treated by the firm as a side line, and there is no one qualified nor authorized to go into such matters. All these disputes take place during working hours. The men are dissatisfied and so are the purchasing agent and the foremen. The local retailers are annoyed and try to make things uncomfortable for the firm. In England and some European countries, tool dealers have stopped this practice by giving the same discounts to tool clubs as to firms.

If employees want to cut out the retailers' profit, let them form a consumers' co-operative society. Costs will then be charged where they belong, and the whole concern run on a proper business footing.

—H. J. Burnham,
Birmingham, England.

Can Engineers Sell?

It is probably more necessary in engineering than in any other line of business that the salesman should be intimately acquainted with the product he sells. Who is better qualified to sell a product than the engineer who helped to design or construct it? His technical qualifications do not necessarily indicate that he has no selling ability. An engaging personality, and plenty of optimism are found in an engineer's makeup just as often as in that of the professional salesman. Moreover his sales talk will be less likely to contain exaggerated claims, and the customer's confidence will be insured.

Failures among engineer-salesmen will generally be found to be men who have been chosen for their engineering knowledge alone, and for their failure, the whole class is condemned. Occasionally too, it will be found that men are on the road who would rather be back in the office. Their failure is a certainty. The successful salesman besides having the qualifications of courage and forceful speech, must find joy in his work.

—Roy Vernon Wade,
Glasgow, Scotland.

How Much Incentive?

My experience with the Halsey system has been that fifty per cent of the saved time should be given the workmen. If 100 per cent is given, the results work out as follows: A man is given a standard time of ten hours for a job and is paid at the standard rate of two shillings per hour. Suppose he completes the job in eight hours.

Then he receives: $8 \times 2 = 16$
$2 \times 2 = 4$

Total 20s.

This twenty shillings is always paid to him, no matter in what time he does the job, provided the time taken is equal to or less than the standard. Consequently the fixing of that standard time becomes of great importance. If the standard time has been fixed 25 per cent too high, the average worker does the job in eight hours, and since he receives 20s., gets paid 2s. 6d. per hour.

If 50 per cent is fixed as the percentage, the above example gives the average man:

$8 \times 2 = 16$
50% of $2 \times 2 = 2$

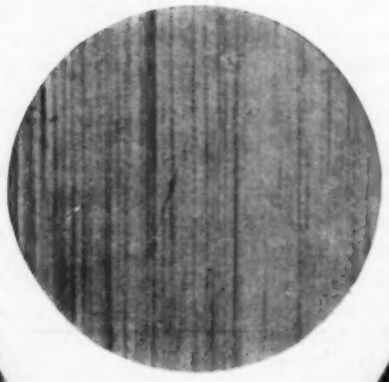
Total 18s. = 2s. 3d. per hr.

The results of the error are not so serious from the firm's point of view, yet the worker is offered a good incentive to beat the standard time. Should only 30 per cent be given, then the worker does not get enough incentive unless the standard time has been much over-estimated.

—A. W. Knight,
Ipswich, England.

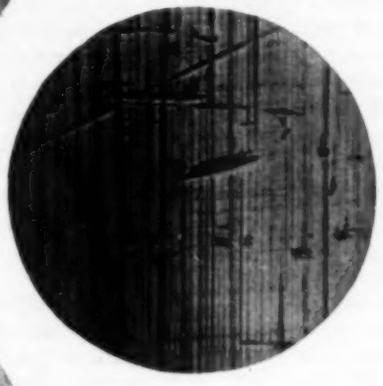
TECHNICAL ADVANCES

Reported in A.S.M.E. Sessions



A working surface, ground with an 80-grit wheel and with no defects visible to the naked eye, magnified to 100 diameters

The same working surface, reground with a 500-grit wheel and magnified to 100 diameters



After lapping and a second grinding with a 500-grit wheel, the surface, magnified to 100 diameters, still shows the lap marks

Lapping of the same surface produces this result when magnified to 100 diameters

CHROMIUM plating achieves a place in the annual report of the A.S.M.E. Machine Shop Practice Division by virtue of its new use as a protective coating against exceedingly high temperatures coincident with deteriorating gases, as in plating the rifling of field guns. It is proving successful in replating worn gages to their original dimensions and in prolonging twist drill life, in all cases increasing utility because of its wear resistance.

Large-capacity honing machines have been developed for interior finishing of large cylindrical elements such as 16-in. gun bores and locomotive and Diesel engine cylinders. Superfine abrasives are also playing an increasing part in the obtaining of so-called "quantity precision," both in the products and in the instruments for their high-precision inspection at production speeds. Cutting oils and coolants, both for grinding and for other machining operations, remain comparatively unopened books and offer prolific fields for extensive future research.

Color in machine tools, a tendency in direct opposition to the newly set standard machine-tool gray, is gaining ground following studies which prove definite increases in worker efficiency result from stimulating colors. One example is the planned orange-colored machines of the new Simonds plant, so colored to "increase their visibility," reduce accident hazards, cause the worker to keep his machine cleaner, and to increase his efficiency.

Tungsten-carbide tools, while finding increasing use, require much additional research to decide their exact capabilities. They are now being used for some heavy machine tool work, but are often hampered by being applied on obsolete equipment incapable of carrying increased feeds and speeds. In connection with the use of tungsten carbide, the paper by L. J. St. Clair of the Carboloy Company, "Cemented Tungsten Carbide as Applied to Cutting Tools," describes the origin, development, and manufacture of cemented tungsten carbide, and lists as most important factors in its successful application these four: design of cutting tool, the machine tool, care of the cutting tool

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Summaries of the new developments in machine shop practice, management, cutting materials, finishing, inspection, and other subjects

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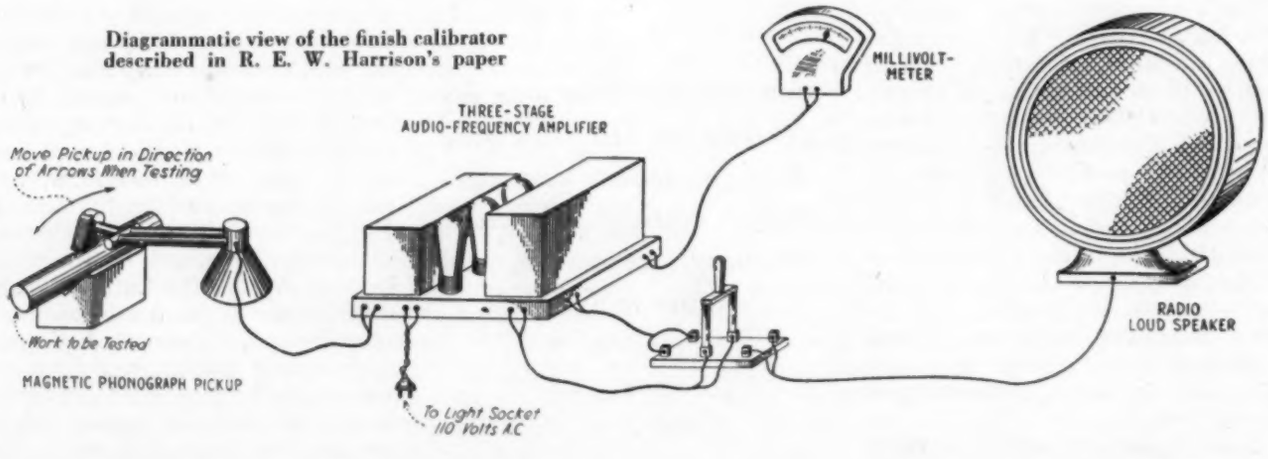
in operation, and grinding. Tool design is fundamentally a problem of getting sufficient support for the tip and at the same time allowing for proper clearance angles. Generally speaking, the tip should be sufficiently large to withstand any cutting strain, and the shank should have the greatest possible top-to-bottom dimension to support the tip. The tool set-up should be as rigid as possible, with any looseness of incorrect mechanical condition likely to cause vibration or chatter eliminated. Overhang of tool should be kept at a minimum. Machines should not be run at the highest speed possible as soon as tungsten-carbide tools are applied, but should be started at a slower speed and gradually accelerated in order to determine the critical speed at which the tool should be run on the particular application. Honing a tool while it is still in fair shape will prolong its life between grinds, lower grinding costs, and increase its total productive life. In grinding, the grinder must be free from vibration. Machine grinding is preferable. Down feed in automatic grinding should not exceed 0.003 in., and the wheel should run at a surface speed of about 5,000 surface feet per minute. Light pressures should be used, and the tool moved transversely across the wheel face. Wet or dry grinding can be used, but the wheel must be dressed frequently to prevent glazing and consequent burning and checking of the tool. If a coolant is used it should be a heavy flow. If the tool is ground by hand, rest and angle fixtures on a pedestal-type grinder should be used and the tool kept in motion constantly to minimize glazing and to keep the wheel true.

Defects existing in present-day accepted standards of finish of mechanical components are reviewed in "A Survey of Surface Quality Standards and Tolerance Costs Based on 1929-30 Precision-Grinding Practice," by R. E. W. Harrison, Engineering Director of Cincinnati Grinders Incorporated. He points out that it is useless to specify extremely close limits of accuracy unless measurements are made across basically plane surfaces. Size control and its effect on cost of production, as well as the length of useful life, is discussed, and better finishes are advocated as a means of reducing the ill effects of high initial wear, such as occurs in the "running in" process on engines. A scheme for the establishment of definite standards of finish is advanced by Mr. Harrison, its success depending upon the finish-calibrating instrument shown at the bottom of this page. The illustrations at the beginning of this article, of magnified working surfaces after various finishing processes, show graphically the difficulty in obtaining a really good working surface. The 80-grit ground piece is of the sort formerly used, which required a long "running in" period, and when run in was half worn out. The remedy is obviously a better initial finish, something that introduced difficulties in specifying the degree of finish of a surface. Mr. Harrison's finish comparator embodies an electromagnetic type sound detector or pickup as used in the better electrically operated phonographs. This instrument is connected to a radio amplifying unit and records minute vibrations caused by irregularities on the surface of the work inspected, reproducing them through a loud speaker. Contact with the work is made with a chisel-edged sapphire, and a millivoltmeter records the amplitude of current which is directly proportional to the vibration and which passes across the grid of a supplementary radio tube. Work which is relatively roughly ground produces a deep, harsh vibration in the speaker and a relatively large movement of the millivoltmeter needle; a finely ground piece produces a keen high note characteristic of minute vibration and results in a small swing of the needle. A rack of plugs ground to the various progressive stages of finish gives an actual comparison with any work piece. Racks and equipment are placed in engineering, grinding, inspection, standards, and laboratory departments for reference.

Metal-cutting materials were discussed by the A.S.M.E. Research Committee, in Mr. St. Clair's paper on tungsten carbide, "Tool Steel Tools" by A. H. d'Arcambal, Consulting Metallurgist, Pratt & Whitney Company, and a joint paper by W. A. Becker and E. E. Gordon, Haynes Stellite Company, and W. A. Wissler, Union Carbide & Carbon Research Laboratories, describing the uses of Stellite. Mr. d'Arcambal's discussion was centered about high-speed steel applications, especially as applied to small tool manufacture. He stressed the necessity for a combination of proper design, materials, and heat-treatment to obtain maximum tool performance. Detailed discussion, too lengthy to be included here, is given in the paper on design of various types of small tools, quality of steel used, hardening treatment, grinding, and cutting fluids. The paper on Stellite described briefly the physical properties of the material and gives important details of several types of machining operations on which it is being used successfully. Its most important property is red-hardness. Measurements of hardness were made up to 1,100 deg. C., the resulting data showing that this cobalt-chromium-tungsten alloy is harder than high-speed steel at temperatures above 500 deg. C., a factor in its superior cutting

Diagrammatic view of the finish calibrator described in R. E. W. Harrison's paper


MILLIVOLT-METER
THREE-STAGE AUDIO-FREQUENCY AMPLIFIER
Move Pickup in Direction of Arrows When Testing
RADIO LOUD SPEAKER
Work to be Tested
MAGNETIC PHONOGRAPH PICKUP
To Light Socket 110 Volts A.C.

MACHINABILITY DATA ON STEEL SCREW-STOCK BARS

Material	Force of planer tool "F," total	Force of planer tool "U," unit	Force of planer tool Hp. per cu. in. per min.	Drilling Torque, ft-lb.	Drilling Thrust, lb.	Drilling Hp. per cu. in. per min.	Drill penetration, in. per 100 r.p.m.	Milling "E," ft-lb. per chip	Milling Hp. per cu. in. per min.	Brinell hardness
1 1/16-in. rd. super-free cutting	...	...	...	23.4	790	0.844	0.111	27.63	2.680	207
1-in. rd. (imported)	1430	286 0	0.722	22.3	800	0.805	0.100	28.23	2.738	180
1 1/8-in. sq. SAE 1112 cold-drawn, 1/16-in. draft	1475	295.0	0.745	24.5	1000	0.887	0.135	28.53	2.762	196
3/4-in. sq. SAE 1120 cold-drawn, 1/16-in. draft	1717	343.4	0.866	26.0	900	0.938	0.127	27.99	2.718	156
1 1/2-in. sq. SAE 1120 cold-drawn, 1/16-in. draft	1579	315.8	0.797	27.3	900	0.984	0.123	28.86	2.798	163
3/4-in. sq. SAE 1112 cold-drawn, 1/16-in. draft	1444	288.8	0.729	21.5	1000	0.777	0.131	28.50	2.760	207
1 1/8-in. rd. mang. screw stock cold-drawn, 1/16-in. draft	1604	320.8	0.810	27.6	1050	0.995	0.123	27.51	2.670	170
1-in. rd. SAE 1315 cold-drawn, 1/16-in. draft	1561	312.2	0.789	26.5	860	0.955	0.139	27.42	2.660	179
1 3/16-in. rd. SAE 6140 cold-drawn 1/16-in. draft	1646	329.2	0.831	31.5	1250	1.138	0.091	30.45	2.950	228
1 1/8-in. rd. SAE 2320 cold-drawn, 1/16-in. draft	1656	331.2	0.836	30.0	1020	1.082	0.081	34.83	3.380	205
1 1/4-in. rd. mang. carbon alloy, 1/16-in. draft	1497	299.4	0.756	27.0	1250	0.975	0.090	30.66	2.970	255
1-in. rd. special mang. carbon alloy 1/16-in. draft	1534	306.8	0.775	25.2	1050	0.922	0.113	27.69	2.685	199
1 1/8-in rd. SAE 1320 cold-drawn 1/16-in. draft	1612	322.4	0.814	27.0	1050	0.975	0.124	29.73	2.880	168

quality. When used for milling, three typical jobs on cast iron show 87,100, and 27 per cent increased production over high-speed steel. The increase was 64 per cent in boring cylinder blocks, while turning operations in cast iron showed 33, 35, and 60 per cent increases, and on steel, 125 and 93 per cent. In general, Stellite bits and blades can be used economically on all operations on cast iron, semi-steel, malleable iron, bronze or similar metals, and on mild steel if the section is heavy and the tool is rigidly supported. It has not been successful on automatic or semi-automatic machines for cutting steel.

Comparison of standards of metal fits and the derivation of a set of three standards for the use of the Kelly Press Division, American Type Founders Company, are described in a paper by C. R. Reiman, under the title, "Sizes and Tolerances for Metal Fits." Simplification for better understanding is aimed at, and the need for a common definite standard practice for industry is indicated. The maximum hole diameter is basic for fits on studs and short ground diameters, the tolerance being applied so the hole diameter is basic to under. The hole size is common to all three kinds of fits (running, wring, and force) while the stud size changes agreeable to the kind of fit. For the tolerances and sizes for fits on ground shafts, the shaft size is common to all three kinds of holes, while the hole size changes for the wring and force fits only. Sizes and tolerance for commercial cold-drawn bars are arranged so that the maximum of the hole for running fits is basic and the shaft size is common to all three kinds of fits.

"Properties of Non-Ferrous alloys at Elevated Temperatures," by C. L. Clark and A. E. White, University of Michigan, gives the results of an investigation of the properties of certain alloys at temperatures to 1,000 deg. F., short-time tensile, and long-time creep tests being used. Alloys considered are of four groups: nickel-copper, nickel-cobalt-titanium, copper-zinc, and copper-zinc-tin series. Testing was done both above and below the lowest temperature of recrystallization of the alloys. Results indicate a superiority of the nickel-base alloys over the entire temperature range. The outstanding member of the group was Konel metal, which has short-time tensile properties at 1,000 deg. F. comparable to Enduro KA2, and the greatest creep resistance at this temperature of any alloy of which the authors are aware. Monel metal retains its properties well up to 800 deg. F. Of the copper-zinc alloys, those containing 70 per cent or more copper are superior to those with 60 per cent of this element. None of these alloys can be used at temperatures much above 400 deg. F., and for those containing lower amounts of copper, 300 deg. F. is believed to be the maximum working temperature.

Results of machining tests on 13 cold-drawn screw-stock steels are summarized in the table on this page taken from the paper "Machining Properties of Some Cold-Drawn Steels," by O. W. Boston, University of Michigan. These data were determined by measuring the force on a planer tool, the torque and thrust of a ¾-in. diameter drill, the penetration in inches per 100 revolutions of a ¼-in. diameter drill, and the energy in foot-pounds required to remove a chip by milling. The author also compares surfaces left by shaper tools, and tabulates machinability data on two "stainless" steels, one a stainless chromium iron annealed (Cr. 13.35, Si 0.18, S 0.022, P 0.012, Mn 0.31, C 0.06) and free machining rustless steel (Cr. 15.15, Mo 0.25, Si 0.14, S 0.46, P 0.016, Mn 0.30, C 0.09). Values for the iron were approximately twice those for the steel, except for drill penetration, which was about half.

During three and a half years spent in the installation of American methods of management in a variety of plants and mines in nine different European countries, Wallace Clark noted a number of characteristics of European industry which are summarized in his paper, "American Management in Europe." These characteristics are: Less mass production because of tariff walls, habits of people, and lower purchasing power, investment turnover slower because of less efficient management, class distinctions limit the number of practical men among executives, introduction of research results to practice is slower, more labor is wasted because wages are low, greater respect exists for knowledge and authority than in America. These characteristics apply only partly to Great Britain and not at all to Russia. The author found the following differences in the installations of mechanisms of management: in Europe more time is required to secure the delivery of purchased materials; rearrangement of old buildings is more frequently necessary; reserved-time scheduling is more needed than chain production; market research and sales organization have not made much progress; budgeting is well understood; methods of executive direction are as much in demand as in America; there is an increasing understanding of the fact that conditions are changing and that methods must be flexible; new management has brought better conditions, higher wages, and steadier employment.

HOT ZINC BATHS FOR STEEL

WALLACE G. IMHOFF
President, The Wallace G. Imhoff Company

Fig. 1—Two large crystals in ordinary slab zinc used for galvanizing, magnified 36 diameters

A PRACTICAL working knowledge of some of the characteristics of galvanizing baths is a big asset in securing a high-quality product, and in the economical operation of the process. One of the most important factors governing the character of the bath, however, is the purpose for which the galvanizing is used. In some cases the chief requirement is merely corrosion resistance, as on high-tension transmission towers. The coating is heavy, and there are no bending requirements. For sheet-metal articles, such as pails and similar articles, both corrosion resistance and appearance are important. The spangle helps to sell the article. In "tight coat" galvanizing, a very light coat must resist corrosion and also withstand severe bending and forming operations.

Each type of galvanizing is done for a definite purpose, and definite characteristics of the galvanizing bath are necessary to accomplish the results desired. It would be easy to make corresponding changes in the bath, except that many outside influences, over which the operator has little or no control, alter the chemical composition. The furnace may continually overheat certain parts of the bath, or the bath may be cold and hard to heat, or the flexibility of operation may be very poor.

It is most important in galvanizing that a high-grade zinc be used. Few users realize the effect of poor metal. With high-grade zinc it takes from one to five weeks to saturate the bath with iron. In some instances the pot is emptied out each week and new metal put in; in others, pots do not become saturated for about six weeks. The usual time is two to three weeks.

Standard specifications for zinc require that it must contain less than 0.08 per cent iron. Some metals contain as little as 0.04 per cent. The average bath when first melted has about 0.06 per cent. With poor metal as much as 18 in. of dross sometimes settle out. The bath becomes saturated at about 0.10 per cent iron, but the amount may be higher as the temperature increases. Ordinary baths saturated with iron at galvanizing temperatures carry about 0.11 to 0.13 per cent iron. Dross settles out beyond this point.

Iron in zinc is detected easily. At low temperatures the iron remains in solution if the amount is small, but when the temperature is raised above 900 deg. F. iron at once forms a zinc-iron alloy crystal that can be recognized by its shape. Fig. 1 shows two large crystals in an ordinary commercial zinc used for galvanizing. The iron content of this metal was 0.04 per cent. In addition to iron, the metal also carried small quantities of cadmium and the allowable lead content.

At the start, zinc baths closely resemble in chemical composition the slab zinc used, but the composition changes rapidly as the temperature is raised and the bath is used. Its iron content increases and, as operations continue, oxides are held by the metal. As soon as production starts the influence of the type of work upon the bath becomes an important factor. Aluminum, tin, and other metals may be aded for definite purposes. For electrical conduit, the bath is kept as pure as possible; for sheets, tin is added to bring out the spangle; for metal ware, tin and aluminum both are added and sometimes cadmium; and for pipe, both tin and aluminum may be added.

The chemical composition of some typical galvanizing baths taken during routine production work are given below. A metal-ware bath, when the quality of the work was high, contained 2.34 per cent tin, 0.10 per cent cadmium and 0.16 per cent aluminum. In a range boiler plant an analysis shows 98.66 per cent zinc, 0.93 per cent lead, 0.015 per cent copper, 0.043 per cent iron, 0.004 per cent aluminum, and 0.35 per cent cadmium.

Many tests made by the writer have proved conclusively that the more iron the zinc bath contains, the heavier is the coating deposited. Bablik, in his book "Galvanizing," confirms this fact. New zinc gives a lighter deposit than a bath that has been in operation

for some time. Tin tends to give a lighter coating, because metallic additions of tin thin the bath very considerably and lower its freezing point. Aluminum in good zinc also tends to thin the coating, but in combination with high iron content, and especially when the temperature is a little low, the coating becomes very sticky and the bath very sluggish. Such conditions produce a very rough, ragged appearance, especially when the articles touch and rub over each other.

Tin additions tend to give a very smooth coating, but great care must be exercised in adding tin, as it accelerates corrosion and promotes the formation of "white rust" and "tarnish." In galvanizing pipe and other classes of work to be drawn through dies, particular care must be given both to the character of the bath, and to the condition of the dies. A light coating and smoothness are desirable.

Brittleness in galvanized coatings may result from too high iron content in the bath, too low a galvanizing temperature, or too high metallic additions to the bath. Antimony additions, especially, should be avoided when brittleness appears. Too heavy a coating or too rapid cooling also may be the cause of brittleness.

Fluidity of the galvanizing bath is an extremely important factor in controlling the weight of coating deposited. A new bath is usually very thin and fluid and the metal deposit correspondingly light. Temperature and chemical composition are the two factors which largely influence the fluidity of the bath. Fluidity increases with the temperature. At from 30 to 50 deg. F. above the melting point most metals are very thin and fluid. Excessive temperatures tend to burn or oxidize the metal. High temperatures cannot be used in galvanizing because the higher the temperature the faster the zinc-iron alloy forms. Up to 860 deg. F. the action is slow, but above this temperature it gradually increases in intensity, until, at 900 deg. F., the alloy begins to form at an alarming rate, changing the chemical composition of the bath, and ultimately destroying the container.

Bath composition also directly influences peeling and flaking of the coatings. A bath high in iron content is brittle and peels easily. Additions of antimony, sometimes used to develop a certain type of spangle, if the temperature is raised above a certain point, weaken the coating and cause it to peel and flake very easily. Close study of the failure reveals that fractures occur at the boundary lines of the "flower spangle."

Fig. 2—Star-like spangle resulting from the use of tin and aluminum additions to the galvanizing bath

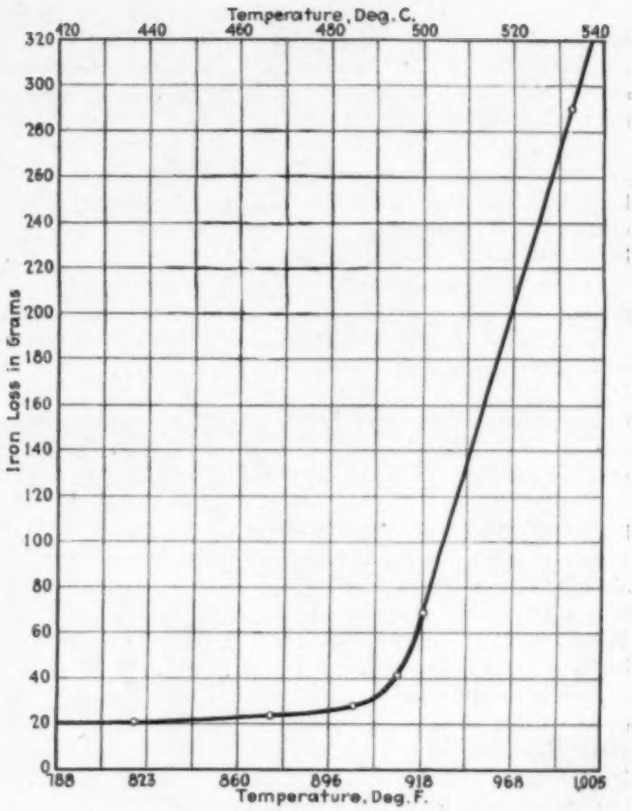


Fig. 3—Curve showing how temperature affects the dissolving of iron from walls of container

Tin and aluminum additions both tend to increase the brightness or luster of the galvanized coating. Both these metals are added to the bath also to open up the spangle. Tin additions cause the spangle to form star-like crystals. Many of these crystal forms are seen in Fig. 2.

One of the most important factors in galvanizing is the temperature of the bath. At ordinary galvanizing temperatures baths are not very destructive of pots, but if the temperature exceeds 900 deg. F. the container is destroyed rapidly, as the accompanying graph, Fig. 3, indicates.

Good commercial zinc has a specific gravity averaging about 7.15 to 7.20. Iron has a specific gravity of 7.86. Consequently, as the bath becomes saturated with iron, its specific gravity increases. Actual tests show the bath to have a specific gravity of 7.29 to 7.35 for ordinary working conditions. The higher the operating temperature, the higher the specific gravity and the higher the iron content. A bath standing quietly over night will clear itself, the iron settling to the bottom as dross.

Another important practical consideration affecting the bath is work lost in the bath. Some pieces are dipped in small baskets and must be turned over to be sure that the flux is all off them and that the coating has "taken." Pieces that are poked, or that float out of the baskets, should be removed every night, if small — at once, if large; lost pieces destroy the bath and run up the dross production at an alarming rate.

High dross accumulations in the pot not only decrease the life of the bath, but also tend to make the coating very brittle. For that reason the bath should be drossed at least once a week, and if the production is high, twice a week or oftener. In pipe galvanizing plants operators often dross the pot daily. Another vital reason for

keeping the pot clear of dross is that, as dross accumulates and sweats in the bottom of the kettle, the temperature increases at the dross line, and soon the action of the zinc at the increased temperature, dissolves away the tank wall.

Heat input is directly proportional to the tonnage galvanized. Heavy material usually contaminates the bath more quickly than lighter material, because the bath must be kept at a higher temperature in order that more heat be supplied in a given time.

Depth of bath also affects the life of the pot and the general condition of the bath. Pots are made either shallow or deep, depending upon the kind of material to be galvanized. For ordinary work a depth of four feet is standard. It is difficult to obtain proper heat distribution with deep pots, hence excessively deep kettles are likely to fail quickly. One seven-foot kettle failed in three weeks after it was installed.

The purer the bath, the lighter is the coating and the better the adherence of the metal to the base. A bath which is highly contaminated with iron, and short of aluminum, develops white frosted areas very easily. This seems to result from a shortage of metallic "skin." Highly contaminated baths are "dry" and the deposit has a frosted appearance.

Another important consideration is the "metal line" of the bath. Some plants operate with the metal level about 2 in. below the top of the pot. Others carry the level five to six inches below. When no flux is used the bath can be high, but when a flux-box is to be made, using three sides of the kettle, the bath is held at a lower level. In some classes of work no molten flux is used. In other classes half the pot is employed as the fluxing side, and in still other classes the entire surface of the bath is covered with molten flux.

Galvanizing baths are affected also by the amount of iron salts carried over from the pickling department. Tests have revealed the amazing fact that the largest part of the iron to form dross may be derived from the pickling solutions. The iron dissolved off the steel forms ferrous sulphate, which is carried over into the muriatic bath, and with iron oxide, resulting from corrosion during the drying operations, forms iron chloride. The iron salts dry on the parts, and when they go into the bath, the zinc quickly reacts with the iron salts forming a zinc-iron alloy. If large amounts of iron salts are carried over from the pickling operations they also destroy the flux and greatly increases the quantity of sal-ammoniac required.

Still another important factor affecting the character of the galvanizing bath is the quantity of oxides and scum in the bath. Careful tests have revealed that the galvanizing bath must be in equilibrium as regards metal additions and temperature. For example, a bath of zinc alone will carry, for each temperature, a definite quantity of aluminum. Any excess of aluminum added forms a blue oxide, or dirt that floats on top of the bath with the zinc oxide. If an excess of aluminum has been added, the addition of a little tin to the bath will take up this excess aluminum and no oxide worth mentioning will be formed. If too much tin has been added and yellow tin oxide forms and ruins the coating, a small addition of aluminum will take up the excess tin, and the yellow discoloration will disappear.

The balancing of metal additions to the bath, and the influence of each is a study in itself, especially since such additions may develop brittleness, white rust, peeling, or some other defect after the coating has been applied. It is not uncommon to have an entire carload of parts rejected owing to some of these defects, for a coating which flakes readily, is useless.

There have been instances in which pots have had to be dipped out because to much aluminum had been added to the bath, and it was impossible to keep a flux on the pots. The seriousness of such an incident is realized when the cost is reflected in the loss of production, in addition to the metal rendered useless until it can be used up again, a slab at a time.

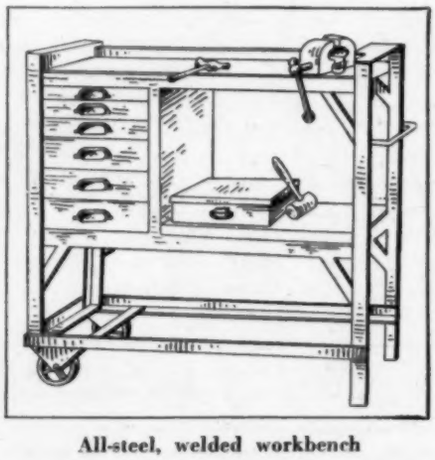
Two Drawers in Benches—*Discussion*

E. ANDREWS
Manchester, England

THE ABOVE subject in "Seen and Heard," by John R. Godfrey, on page 690, Vol. 72, of the *American Machinist*, and the discussions thereon, under the title given above, by George M. Richards and J. T. Towlson, on pages 657 and 693, Vol. 72, of the same journal, have emboldened me to describe a workbench made in our shop.

As shown in the illustration, the bench has casters on two of its legs, so that it can readily be moved from place to place, or from job to job. If the bench is intended to be more or less of a permanent fixture, the casters may be omitted. The bench is entirely of steel and all joints are welded by the oxyacetylene process. The framework is made from $1\frac{3}{4}$x$1\frac{3}{4}$x$\frac{3}{16}$-in. angles and is braced of $1\frac{3}{8}$x$\frac{3}{16}$-in. flat steel. The top, shelf, panels, and drawer runners are made from $\frac{1}{16}$-in. sheet steel, while the drawers and the toolbox are made from $\frac{1}{32}$-in. sheets of the same material. The top is 5 ft. long, 18 in. wide, and is 39 in. from the floor. There is a stiffening plate on the top, to which the vise is bolted.

As is well known, keeping track of tools in a jobbing shop is not an easy task, since no one is directly responsible for them. The last man who uses a certain machine, throws down whatever tools he has used, when he is through, and passes on to the next job. The next man using that machine has to hunt for the tools. Such a bench as has been described, with its six drawers, ample top, shelf, and toolbox, provides ample space for the storage and proper arrangement for all tools used in connection with most machines.



All-steel, welded workbench

WHY NOT A NEW TAPER PIN STANDARD?

G. F. McClay
Sherbrooke, Quebec, Canada

HOW MANY readers who have had occasion to use taper pins have asked themselves this question. On the other hand, many may say, "Why disturb anything that is as firmly established as our present standard of taper pins?" I would like to point out some shortcomings of our present standard, and to suggest changes to overcome them. What I consider the most objectionable feature of our present standard is that the fixed dimension is the diameter at the large end of all pins of a given number. The only thing I can see in favor of this is that the pin manufacturer is able to make all pins of a given number from the same size stock with a minimum of labor. The disadvantages from the user's point of view are as follows:

1. Pin numbers have no connection with the drill size required for the pin.
2. Each pin of a different length but of the same number requires a drill of a different size.
3. Inability to ream a blind hole for any but the longest length of pin of a given size with a standard reamer.
4. Extra work involved, either in the drafting room or shop, in looking up the proper size of drilled hole to use for a given pin.

As an example, we will say we wish to locate a valve cage in a high pressure air cylinder where the thickness of metal available for the pin is 2 in., and we wish to use a No. 6 pin 1½ in. in length. We cannot drill over 1¾ in. deep on account of breaking into a high-pressure passage. Looking up a table of taper pins, we find that the diameter at the small end of a No. 6 taper pin 1½ in. long is 0.310 in. Since this is 0.0025 in. under $\frac{5}{16}$ in., we will use that size of drill. Now comes the real trouble. When we get a No. 6 taper pin reamer we find that it is only 0.270 in. diameter at the small end. We cannot use this, as it strikes the bottom of the hole when we only have a diameter of 0.3064 in. at the large end of the hole and we want a diameter of 0.341 in. A No. 7 reamer is 0.328 in. diameter at the small end, so we cannot use that. The only way we can ream the hole is to cut 1$\frac{5}{8}$ in. off the small end of a standard No. 6 reamer. This will probably mean a new reamer the next time a No. 6 pin is used.

My suggestion for overcoming this trouble is to revise our taper pin standard, making the small end of the pin the fixed diameter. Make this diameter the number of the pin in thirty-seconds of an inch and maintain the present taper of ¼ in. per ft. on the diameter. Applying this proposed standard to the above example, a No. 10 pin would be used; the draftsman or shop man would not have to look up a table, or get a sample pin to find what size of hole to drill. No. 10 would show that a drill $\frac{10}{32}$ in. in diameter was required. Until such time as new reamers were available to match the proposed standard, present standard reamers could be used. Once a reamer was cut down to suit such a condition as given above, it could still be used for all No. 10 pins up to the limit of the length of the flutes left on the reamer. With new reamers to match the pins, it would not matter if holes were blind, as the reamer would be required to go only as deep as the pin. This is quite different from the present standard. Reamers could be made with longer flutes than the present standard; then as the most of the work would be done with the small end of the reamer, and was worn and ground down, the working surface would be shifted towards the large end of the reamer, the small end being cut off to maintain the standard size. The proposed standard would mean a saving of time in the drafting room and shop, (time now spent in looking for taper pin lists to find the size at the small end of pins) and a saving in reamers, as they would not have to be cut off to ream short blind holes. The following is a table of taper pins made up in accordance with the proposed standard. Comments on this from readers would be appreciated.

Proposed Standard for Taper Pins

Pin No.	Diameter at Small End	Length Shortest Pin	Length Longest Pin	Diameter at Large End Longest Pin
2	0.0625	½	1	0.0833
3	0.0937	½	2	0.1353
4	0.1250	½	3	0.1875
5	0.1562	½	3	0.2187
6	0.1875	½	3	0.2500
7	0.2187	½	4	0.3019
8	0.2500	½	4	0.3333
10	0.3125	½	4	0.3958
12	0.3750	½	4	0.4583
14	0.4375	½	5	0.5416
16	0.5000	½	5	0.6041
18	0.5625	½	5	0.6666
20	0.6250	½	5	0.7291
24	0.7500	1	6	0.8750
28	0.8750	1	6	1.0000
32	1.0000	1	6	1.1250

■

Tungsten Carbide for Commutator Turning

TURNING of commutators the segments of which are insulated with mica, is hard on tools—so hard, in fact, that, to secure the desired finish, it is sometimes necessary to regrind tools during the process of finishing a single commutator.

Tungsten-carbide tools have been tried for this purpose, however, with excellent success by a maker of office machines who builds his own motors. The commutator in these motors is less than one inch in diameter, yet before tungsten-carbide was tried, it had been possible to finish only eight pieces between tool grindings. When we last visited the plant in question, tungsten-carbide tools had been used to finish 3,000 pieces without regrinding, and still were "going strong." This surely is a good example of one class of work in which tungsten-carbide fully justifies claims made for it.

The Foreman's Round Table

MECHANIZED

"WHERE are you keeping yourself these times, Al? You don't call for me mornings, or go home with me at night. Getting tired of your old buddy?"

"Not a chance, Ed. I am getting here early and staying a little overtime so I can have time to consider what economies I can make in the department next year."

"In the words of Joe Cook, you are seeing how many men you can separate from their jobs, eh?"

"Well, that is what it really amounts to, but isn't that rather a queer way for a foreman to express it?"

"Maybe it is, Al. I was glad to see Joe get his chance, but I'm kinda off him lately. He's getting a little too radical and argues at lunch time when the men are around. It may be just hot air and show-off, but it don't strike me as just the thing to argue that machines are taking the bread away from the poor man in the machine shop."

"You're right, Ed, but it is nothing new. History always repeats itself."

"What do you mean is nothing new, foremen turning radical?"

"No, not that, but men rebelling against machinery. Ever think where the word 'sabotage' came from?"

"Before I answer, tell me what it means."

"The dictionary gives the definition as 'malicious destruction of an employer's property during labor trouble,' but it came from the practice of French workmen casting their wooden shoes or sabots into the machinery as a protest against its use. Furthermore, when the Northern soldiers came home from the Civil War they rioted and destroyed the reapers that had been developed during their absence, and which they claimed were taking the bread out of their mouths. In England spinning mills were destroyed in protest against the power loom. Only at this distance can we see how foolish and futile such acts were."

"Well, I can see where their argument was all wrong, but the thing has been overdone and maybe we really have built up what some guy in the newspaper called a Frankenstein. This same feller said that some of the labor unions were talking about going back to hand work so more people would be employed."

"That will be fine if the reversion to hand work does not increase the cost of production to such an extent that no one will buy. And those same unions are largely responsible for the introduction of machinery."

"How do you make that out? If my memory is any good, they have consistently opposed the use of machinery to prevent the very thing that has happened. I remember they fought against concrete mixers, against power wood working machinery on the job, air hammers and other things, and then you say they are responsible for them."

"I don't mean that in a critical way, I merely wish to point out an economic law, and that is that when any method becomes too costly in proportion to related methods, or when some man or some craft has a monopoly that unduly raises the cost or restricts output, it invites the attention and skill of the inventor. For instance, how many miles of road would we have if we still used cobblestones and hand labor?"

"Not many, maybe, but no tourists, filling stations or signs to clutter them up either. I'm not claiming that some machinery is not good, but it's overdone."

"Maybe, but how about the fat and lean years mentioned in the Bible? The hard times of 1873 and earlier? How about China which is wholly manual—or Spain? Ever hear of Coxey's Army?"

"I don't pretend to know the answer, Al, but if it isn't machinery, what is it?'

"I'm no wiser than you are, Ed, but I know that machinery equalizes the rich and the poor and makes them equally discontented. It seems to me a choice between handwork and actual necessities, or machines and luxuries."

Is the cry of mechanization the modern version of blaming human folly on the gods? Are we paying the cost of the short working day? Is the high wage, high self-consumption theory sound?

▸ ▸ ▸ Discussion of Former Topics

A Friend at Court

Al claims that he hired a friend and immediately costs went up, and he was in a jam. Well, Al must have been asleep. If, when things are going good and you make a change, and everything goes "haywire," why not look over your "change."

Why condemn all your friends for the sake of one failure? There are a lot of good men who will "go through" for you if you are square with them. Of course, when you have a friend working for you and it gets to be public information, the other men are very apt to get suspicious of him. But, if they find that you are giving them the same deal that you are giving him, this is bound to die out in time.

I would not penalize a man because he was a friend. If he is worthy of being your friend, he will go out of his way to help you. If he does this and an opportunity for advancement occurs, I think there is very little doubt that he will continue to come through for you if you give him the opportunity.

A person has to be rather a student of human nature if he is to handle men, and sometimes I think we are apt to expect too much from our friends, because they are friends. —GEORGE W. GIBSON, *General Foreman, Bond Plant, American Radiator Company.*

Who's Who in Industry

How in the name of common sense can anyone claim that an operator running a lathe that has been set up for him, and who has been instructed how to operate it, should have the same rating as a mechanic who sets up his own machine and takes care of his own troubles? The mere fact that the two are producing the same class of work does not justify the same rate.

What incentive is there for experience or ability under such conditions? Why should a man become adept at his trade if a green hand can make as much money on piece work as he can?

I cannot remember having worked in, or having heard of, any plant using other than the skill method of setting rates that was not disappointed with its system.

It seems to me that a system founded on any other principle will either be short lived or a continual source of dissatisfaction among the employees.

—CHARLES R. WHITEHOUSE, *Standards Examiner, Holtzer-Cabot Electric Company.*

The Fortune Teller

Reaction tests are not reliable in indicating the mental alertness and mechanical aptitude of the general run of applicants at the personnel office. The average applicant is too keyed up about getting a job to be able to give the true psychological picture of himself on a reaction test. If it is desirable to acquire this data it can best be secured after an applicant is happily located on a job in the plant. Under actual working conditions, a man shows his true colors.

Such tests are applicable only for paper records of men. They are generally absolutely worthless and have no part in the rate paid to the worker, unless they can correctly gage the dividend earning capacity of each worker. The personnel directors in this country or any other country who are able to take an unknown and rate his dividend earning capacity, even relatively, can be counted on the fingers of one hand.

The personnel man can invest his time to better advantage in cutting down the number of square pegs in round holes by making a detailed study of successful workers on each operation in each department. A high percentage of these so-called psychological tests are brain children of teachers who have relatively little contact with industry. Thus they merely have a theory which is not based even on practical industrial experience.

—E. E. GAGNON, *Mechanical Superintendent, Raybestos-Manhattan, Inc.*

From Another Angle

Badly dimensioned drawings are a source of inconvenience and annoyance in the shop. All dimensions should, as far as possible, be taken from one end and one side of the component, or if more convenient, from a center line. One cause of confusion and mistakes is the different types of projection used. The type used in a shop should be standardized and all drawings made this way.

Pattern dimensions on shop drawings are often unavoidable, especially on jig drawings, as these are usually "one off" jobs and it would not pay to make separate drawings for each department. They should, however, be left off drawings of production work. Dimensions sometimes are taken from points in space and are of very little practical use. A few minutes of calculating, a little trouble taken in the drawing office, and these can usually be given definitely from machined faces. Parts of a component in definite relation to one another should be dimensioned on the same view, if possible, and both clearly shown. —J. W. HESKETH, *Coventry, England.*

Trade Secrets

Improvements in manufacturing methods, where these are not patentable, should be paid for on a liberal scale based on the estimated yearly saving to the employer.

This would be a direct incentive to all employees to be constantly alert to effect savings in production costs. The legal position in England with regard to trade secrets is: The law implies an agreement by the employee to keep his employer's secrets and he may be restrained by injunction from disclosing them.

It would therefore appear logical that any secret or formula within the knowledge of the employee only,

should be his own and should not become the property of his employer except for an adequate consideration. An employee developing a patent, even on his employer's time and with his (the employer's) materials, is not debarred from taking out a patent in his own name unless there is an agreement between them restricting this.

The nominal sum paid by most firms for improvements in manufacturing methods that are not patentable, are not an incentive to men to assist in reducing production costs. Where a firm is desirous of purchasing a patent from an employee this should be done on a strictly business basis, the relative positions of employer and employee being forgotten for the time being. If this is done, and a fair price is paid, no further obligation on the part of the employer exists.

—W. L. WATERHOUSE, *Staffordshire, England.*

The Fortune Teller

Psychological tests have been pulled on me from time to time with different grades each time. Naturally if the sun is shining and everything is running smoothly, the test answers will not be the same as when it is gloomy and raining or when one is feeling the effects of last night's party.

Psychological tests, like time studies, might be all right if more attention were paid them. Some factories have a time study system where each job is written up minutely. In the office are files upon files, filled with time study records. Are they ever referred to? Very seldom, except to get the total time. —H. FORSCHNER.

In the Driver's Seat

Having the "misfortune" to serve my apprenticeship under a friend of my father, and being punished for the devilment of all the other apprentices, I often during that period contemplated murder, but found later that the stern schooling received was for my benefit, and have passed on similar treatment to others, even to the extent of "firing" the proprietor's son on one occasion. A man or boy coming along on the recommendation of a friend is bluntly informed that no preference can be expected but that his actions and work will be closely watched. With very few exceptions such men have done their best to justify the faith placed in them. It is all a question of starting right, a fact sometimes overlooked by both parties concerned.

If I were called upon to decide the case of Sam Becker, he would be discharged for his own benefit and to provide the opportunity to redeem his self-respect.

—F. P. TERRY, *Belfast, Ireland.*

The Worm Turns

I most assuredly am of the opinion that management is overplaying its hand on welfare work. Perhaps all this welfare work was justified at a time when industry needed every man or woman it could possibly recruit. It may also have been a way to attract and hold in industry those who in the normal course of events would not have been in industry. But that time is long since past, and industry today retains only those who are fundamentally interested in their jobs, because they must do those jobs well and hold them, or else be faced with actual privation or want.

Therefore, I believe the money spent for this purpose could be used to better advantage. I refer not only to the salary paid welfare workers, but all that much greater indirect cost represented by floor space, equipment, time, etc., invested under the head of welfare, and which in most cases has never even been properly evaluated. Applied directly as a saving on production costs, it may even represent the marginal difference in price that will land an order which would otherwise be lost, and which will keep intact a working force, which might otherwise have to be cut. I believe, at this time, that the employee is more interested in the security of his job than he is in any possible small increase in wage.

To the regular production employee, who by his very numbers is the backbone of industry, the sum total of welfare work is often written in red ink. Welfare work interrupts him, it irritates him, in fact it often makes him just plain mad. He's seen fads come and go, and to him this welfare work is the most annoying one of all, for with his background of years, he sees right through its fundamental weaknesses as an instrument of production. —W. F. MICHAEL.

Keep Out

Every department of a manufacturing organization should be so organized that the absence of a supervisor cannot hamper the business. If Johnson's absence left his department without a substitute superintendent capable of deciding on a method of heat treating, the V.P., the sweeper, or the office boy would be entitled to decide.

If, however, Johnson left a capable assistant on the job, and the V.P. made a change without consulting him, Johnson's stand is correct. —J. S. SWAUGER.

The Exception to the Rule

The practice of cutting piece rates is neither justifiable nor ethical, but the practice of readjusting them is both justified and ethical.

I have yet to see a workman who, if approached in the right manner, would not give his consent to a change in piece rate, to correct clerical errors when convinced they were honestly made.

Most workmen are willing to see rates readjusted to make rates the same on similar parts, because they know they will benefit in the long run.

The above I consider readjustments.

The manufacturer, who, after setting rates, finds that on the majority of them the men are earning more than he bargained for, deserves no sympathy. He is getting the benefit of lower costs than he had before, and his men are earning more. Let him make the best of bad management in setting rates loosely.

How can the difference in earning power of men be taken care of more logically than by paying them in proportion to their earning power?

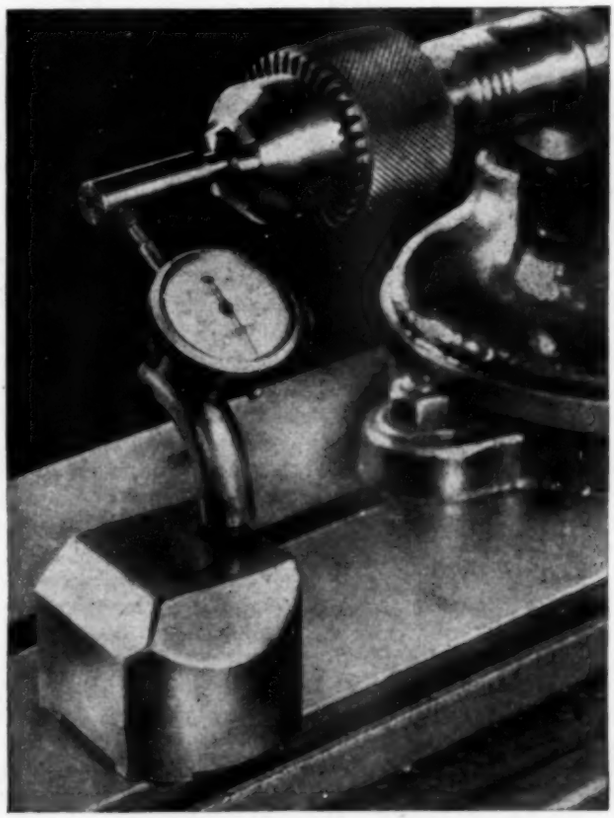
Some men will always be slower, and some faster. Rates must be set for the average man. Decide how much you are willing to pay on the average to save a certain amount of time on a job, set your rates so the average man can earn this, and let the fast man take care of himself. —W. A. WALTER.

Every time the index clicks, three drills must be fed in accurately—if not, broken drills, spoiled work, or damaged fixtures will result—a convincing argument for accurate chucking

WATCH CHUCKS

A brief in behalf of that much abused and little touted connecting link between high-production machines and alloy drills and reamers—the chuck

SHOPS utilizing highly efficient machines and alloy steel drills, reamers, and taps are often prone to neglect the chucks and colets which are just as likely to cause production tie-ups. As a result, the production chain may fail at its forgotten weakest link, and valuable time may be lost in replacing a drill or reboring a spindle, though the fault may not be with either of these units. A survey of the small tools of many plants will show this to be not a theoretical difficulty. Chucks and collets that have done duty for ten, twenty, or thirty years with little or no attention are daily reducing the output of modern machines, going unreplaced because their inaccuracies are blamed upon either the machine or the tool. One reason for chuck neglect is probably the amount of abuse that they can stand and still function, even if not as perfectly as they should.

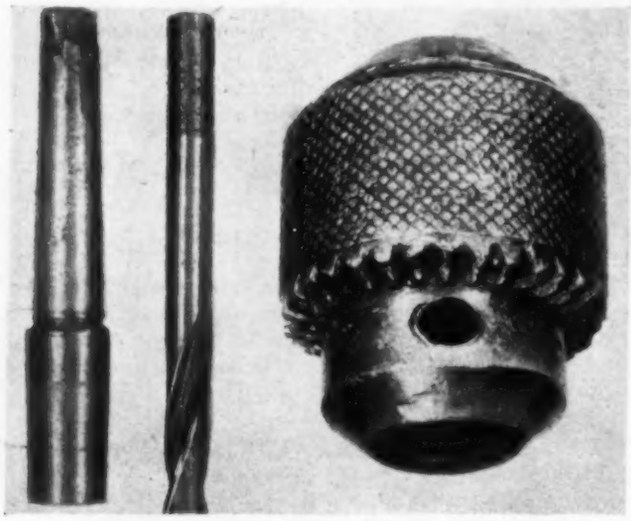


How many drill chucks will pass this test—a requisite for efficient, high-speed drilling?

In one large plant chuck difficulties are eliminated by listing on a record card every chuck as it is received in the shop. If it is part of a machine, it is inspected whenever the machine is looked over; if it is checked out of the toolroom, it is inspected every time it is returned. Brands of chucks that are listed as requiring too frequent repair are not likely to be reordered when more are needed. Then, too, the inspection reveals whether the fault is in the chuck or in its abuse. Officials realize that worn or scored jaws can hardly fail to leave their mark on the tool or work they hold and that scored drill shanks affect the true running of the drill even in a new chuck, the cycle continuing its addition to the cost of production at every step. Other plants consider it economical procedure to return chucks to the manufacturer

for repair. The essential in either case is that the operator who checks out the chuck understands that he must return it immediately should it prove defective, rather than attempt to correct it with hammer and Stillson wrench. Many plants keep a check on drill and reamer breakage as an additional check on chuck performance.

Recent developments in chuck design and materials have resulted in increased accuracy and sturdier construction. Some idea of the changes in design may be



Chuck, drill, and arbor, all three sadly in need of replacement. The soft-bodied chuck of 30 years ago and the battered tangless arbor, both impair accuracy and increase the bill for drills

gathered from a summary of the problems encountered and their final solution. The problem has been principally one of obtaining proper balance between gripping power, wearing quality, and strength. To obtain the gripping power necessary under modern production conditions, many manufacturers have entirely redesigned chuck bodies, redistributing the metal to points where it is most needed. Ribs and bearings on which the jaws ride are being made wider and heavier and ball bearings have been employed. Various makes of ball bearing chucks are claimed to have from 50 to 200 per cent greater gripping power than chucks with plain bearings, and the jaws are designed to withstand this increase. For example, the jaw threads of one make of ball bearing chuck will support a 10-ton shearing stress. Coarser pitch threads and ball bearing construction give more rapid operation, another essential in high-speed production.

When work-holding jaws are controlled individually by driving screws, another problem enters, that of determining the shape, diameter, and size of the screws. Increasing screw diameter necessitates an increase in jaw width, which in turn makes it necessary to cut away a corresponding amount of metal from the chuck body. A number of experiments indicate that screws having a square thread with a coarse pitch give most satisfactory service. Another problem in jaw screw application is that of the thrust bearings provided for them. One of the latest types of bearings is made in two segments, placed together to encircle the screw. This bearing is claimed to take the thrust in both directions, to be self-aligning, practically unbreakable, and to permit chips from the cutting tool to pass out of the chuck without clogging. Further, it does not require a cored recess under the screw, which would, of course, weaken the chuck body.

The greatest possible accuracy is essential in the concentricity of the jaws. One manufacturer is using a specially developed gear-cutting machine for forming and finishing the teeth of scroll chucks in order to obtain this accuracy. Carefully selected and heat-treated alloy steels are used for the scroll plates. The same attention to materials applies to the other parts. Chuck jaw screws are usually made of heat-treated alloy steels, many of them of the chrome-nickel variety. Jaws are of alloy steel, heat-treated and hardened on all surfaces. Interchangeability is attained by grinding all mating surfaces to close limits. Chuck bodies are usually case-hardened. Even the drill chuck keys for the key-type chucks are heat-treated and made of specially selected material.

All these precautions in manufacture and servicing are useless if the operator is not impressed with the importance of proper care. Over-strain, insufficient lubrication, or heavy service without replacement are factors which can be guarded against only by the operator, though the foreman can usually check the accuracy of tools by analyzing the times required for chucking and production operations.

Recent developments have made a wide variety of chucks available for the many types of specialized jobs encountered in production work. For example, one maker of chucks has sizes varying from one large enough to drive a 1-in. drill or boring bar to capacity, to a 2-oz. chuck that will handle a No. 80 drill. Other jobs can be handled on a combination chuck in much less time than is required with a regular chuck. Much of the work formerly done on lathe centers can now be done to advantage on the larger size collet chucks being manufactured.

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Informing Operators About New Machines

JOSEPH BELL
Naval Aircraft Factory, Philadelphia

THE APPRECIATION of most things in life is a function of their cost, either in actual dollars or in the sacrifice of something else to attain them. It is hard for the shop men to be keenly interested in a new machine if they do not know the facts about its cost.

Having made the cost of a new machine a matter of popular knowledge, it is only logical to follow it up with the facts for making the investment. It should be borne in mind that a machine should not be bought in anticipation of obtaining the maximum production quoted by the salesman as an average production for all shops, conditions, and operators. Rather, the required output should be calculated on actual local conditions, and in this way a practical standard of production can be set. This standard will be within the attainment of the operator. If the standard is carelessly set at the maximum, it may have a bad effect, in that the operator will ridicule the standard as being impracticable and impossible of attainment in that factory.

Learning more about the job is of help to everyone. Work directed with a full knowledge of all the ramifications is bound to be more intelligently directed than if the man did not know the final end to be attained.

AMERICAN MACHINIST 1930 INVENTORY

of Metal-Working Equipment

THIS is the fourth and last report on auxiliary equipment. Report No. 5 in Vol. 73, page 471, showed the percentage of furnace equipment over and under ten years of age; Report No. 10 in Vol. 73, page 632, showed the status of plating and finishing equipment; Report No. 15 in Vol. 73, page 821, showed old and new foundry equipment. Since the 1925 inventory was confined to machine tools, no comparison can be made between the figures in the present report or in the foregoing auxiliary groups with the last inventory.

The group compiled here embraces a wide variety of equipment and is necessarily in the nature of a catch-all for classifications left over from the more homogenous reports. For this reason, the percentages of each type of equipment to the total given at the right side of the chart lose some of their significance. They represent, for example, the relation

Report No. 18—Plant Service and Miscellaneous Equipment in Industrial Plants

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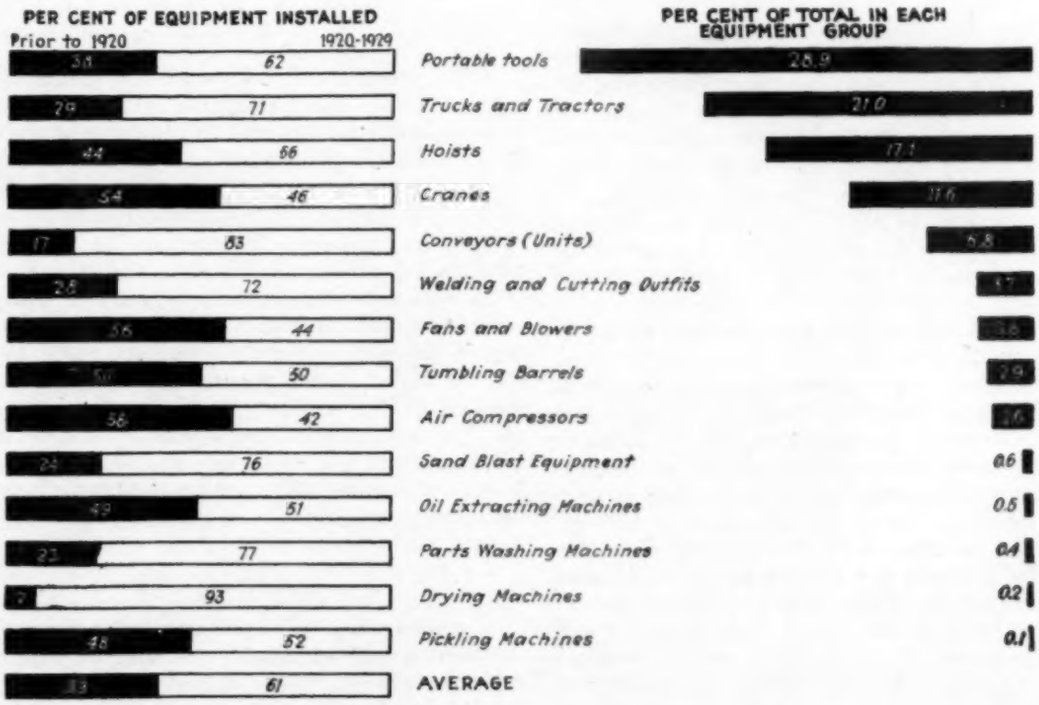
of cranes to a combined figure which includes such unrelated equipment as portable tools and oil extractors. These figures are given for the sake of uniformity with other reports. However, the varied structure of the group as a whole does not detract from the percentages of old and new equipment. In common with the previously reported auxiliary groups, the percentage of plant service equipment over ten years of age is lower than that reported for machine tools.



IDEAS FROM PRACTICAL MEN

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Another Shaper Job

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Eleven contributors give their various ideas on how to solve a somewhat sticky problem

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INSPIRED possibly by the shaper problem published on page 294, Vol. 71 of the *American Machinist*, a subscriber wrote us asking for a solution to a somewhat similar problem. On its face, the operation seemed simple, but when the correspondent stated further on in his letter that he had submitted the proposition to several well known mechanical men, the writer decided that he had better "pass the buck." Accordingly, he wrote letters to several of our contributors in different parts of the world, asking their opinions. The answers received, as might be expected, are all practical, but some appear simpler and some more logical than others, each being the result of different experience.

In the original contribution referred to above, it will be recalled that the article outlined the mechanical method of shaping an angular groove on a tapering surface. Another correspondent pointed out that while the method might be true as regards a line on the surface, it could not be true of a groove, and proceeded to prove it mathematically. Like the original contributor, number two neglected one little item and along came number three and others until it was finally proven correct both mathematically and mechanically. It may be possible that the contributors to this symposium have committed like errors, but the writer feels sure that when it is settled it will be settled right, according to the conditions laid down in the original query. To provide the proper background for discussion the problem is outlined below.

"I wish to make a lot of die blocks 1x8x8 in. Because of the nature of the product of these dies, it is necessary to lay them out from all four sides, and any error will thus be magnified by any slight error from right angles or parallelism. The blocks, therefore, must be perfectly square, mechanically speaking. To manufacture these die blocks I have an 18-in. shaper in good condition, which has a swivel vise. I have trued up the solid jaw and the bottom between the jaws, and find no difficulty in getting two parallel sides. If, however, I swivel the vise and lay the blocks horizontal, I have no way of telling when the finished sides are at right angle to the ram. If I keep the vise jaws parallel to the ram and clamp the blocks vertically, I cannot tell when the parallel, finished sides are perpendicular. There is not room on the bottom of the vise for a square, and I doubt if one would be true enough anyway. How can I shape these die blocks square? And how can I know that they are square, and not merely uniform?

T. SAKAMOTO

Kahuku Plantation Company, Kahuku Oahu, Hawaii

In your shaper problem you have suggested that you would machine the bottom and the face of the fixed jaw of the vise in order to do an accurate work. This may be true, but did you ever try and test your vise after it has been machined. Sometimes, although the vise has been machined it won't be right when you turn the vise 90 deg. This is because the table of the shaper is not true, so before you machine your vise, check up the table whether your machine is new or old. If the table is true, machine the vise if necessary.

Now that the machine is in good condition you can shape the two parallel sides of the die blocks in a vertical position, then swing the vise to 90 deg. and machine the other two sides in a horizontal position assuring that the block was seated firmly against the fixed jaw. As

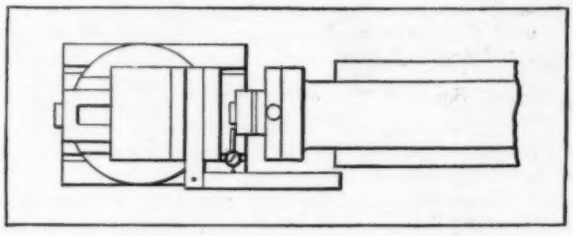

Fig. 1—Squaring the vise with the ram of the shaper

you know, the shaper vise is not graduated with accuracy, so in order to get a perfect square I would raise the shaper vise and square it up from the ram as shown in Fig. 1. If you do this I am sure that you can get your die blocks perfectly square.

•

A. J. PRUSZYNSKI

After truing up the solid jaw and bottom of vise it is important that the vise should be left in that position, with the fixed jaw parallel to ram, during the machining of all sides of the block.

To begin, machine top and bottom of the block in a horizontal position, then machine the two parallel sides in a vertical position. To machine one of the two unfinished sides, clamp the block in the vise, with finished sides approximately vertical. Fasten a square against one of the finished sides of the block, with the horizontal leg of the square slightly above the block as shown in Fig. 2, adjust, and clamp the block tight in vise so the reading of the indicator is the same for both ends of the horizontal leg of the square. Remove square and indicator, machine the side of the block, reverse the block in the vise and machine the remaining side.

•

RALPH M. GAMBLE

Assuming that the fixed jaw and bottom of the vise are square with themselves as well as with the lateral travel of the ram, the operator must true the fixed jaw, by means of an indicator, with the cross travel of the

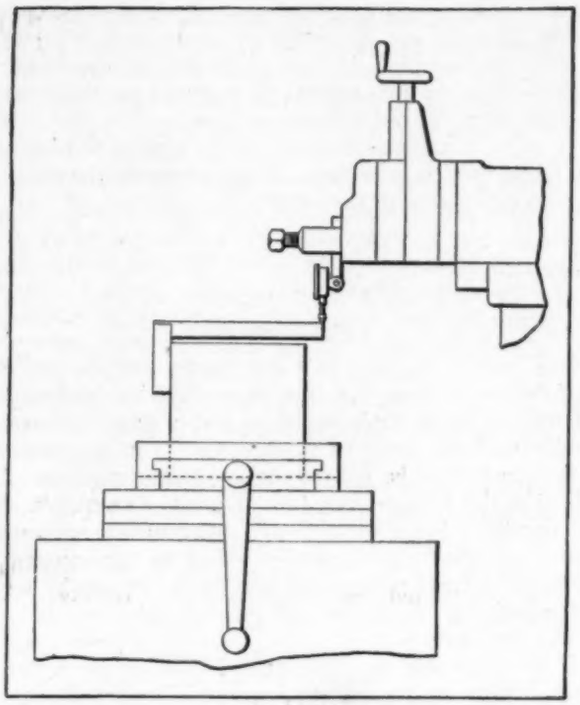

Fig. 2—Squaring the vertical finished side of the die-block

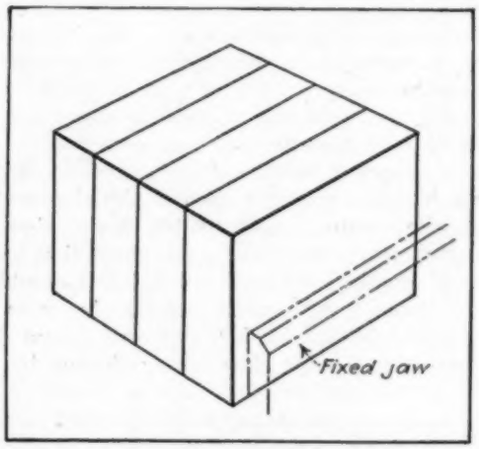

Fig. 3—A multiple method of machining

machine. This is done by adjusting the swivel of the vise.

We can take advantage of the fact that there are a multiple number of blocks to be made, in the following manner, and at the same time do a fairly accurate job, depending of course on the thoroughness of the operator and the accuracy of the machine.

First operation: finish one face of all the blocks, one at a time.

Second operation: finish the other face and one side of all the blocks, one at a time. In this operation the trueness of the machine must be checked for parallelism of the cross feed with the ram, by using an indicator in the tool post. Then the operator must test the down feed by a similar method, using a try-square or angle iron held properly in the vise.

Third operation: place any quantity of pieces together in the vise, with the finished sides on the bottom of the vise as shown in Fig. 3. One face should be solidly against the fixed jaw, the other jaw should have a piece of ¼-in. square cold-rolled steel half way up and between it and the last piece in the vise. Machine the top and one side.

Fourth operation: turn unfinished side up, hold as in third operation, and finish top.

It would seem then that with a good machine and careful operator that there need be no excuse for a bad job if this sequence of operations is followed faithfully.

You will note that in this method, once the machine is set it is not disturbed, and that the operator need concern himself with the task of properly seating each and every piece as it is clamped in the vise, and nothing more. The cut is always against the fixed jaw.

•

CHARLES H. WILLEY
Superintendent of Manufacturing, Hoyt Electrical Works

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If the problem is one of production as well as of accuracy, it can best be solved by making a fixture that will permit accurate machining. If it is simply a matter of trying to machine some blocks square on all four sides, the task is that of squaring the vise after having turned it at right angles to its former position.

The practice followed by the boys in our toolroom for checking the squareness of the vise after turning it, is to clamp a tool maker's square in the vise as shown at

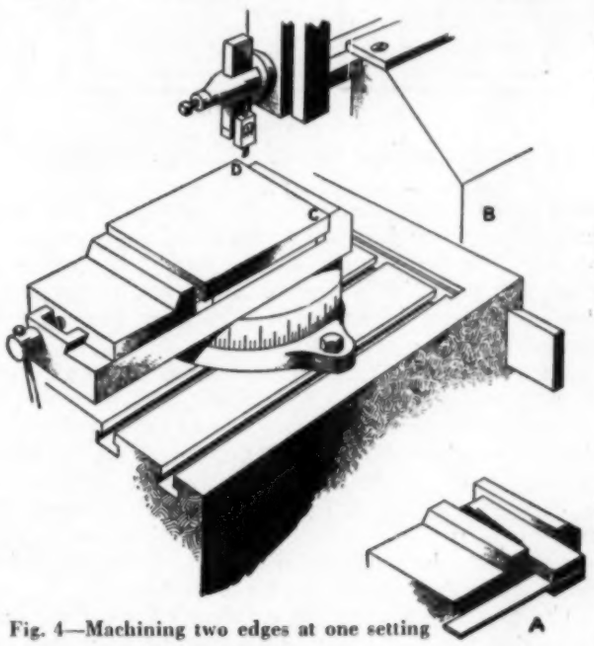

Fig. 4—Machining two edges at one setting

A, Fig. 4, and indicate the travel of the ram along its blade with a clock indicator held in the toolpost.

Another method would be to clamp the two parallel sides in the vise as shown at *B*, and then indicate from *C* to *D* with an indicator by traversing the table.

•

WALTER WELLS
Moscow, U.S.S.R.

In offering my particular method of machining die-blocks, perfect in the sense that the diemaker uses it,

within 0.00025, I must state that I cannot see why this particular job is called a shaper job. I would prefer to surface-grind jobs of this character, or at least use a planer and angle-plate.

Assuming that a shaper is the only machine available, or assuming that we are trying to exploit the shaper as a machine tool to its full capacity, I am certain that it is perfectly in order to question the practicability of using a shaper-vise for clamping pieces 8 in. high. The jaws of the shaper ranging from $1\frac{3}{4}$ to $2\frac{1}{2}$ in. in height and the chance for accumulated error is about 4 to 1. I would begin the job by removing the vise altogether and proceed to clamp the pieces to the top of the shaper platen.

The machining of the flat surfaces of the die block, parallel to each other, not being in the discussion, we

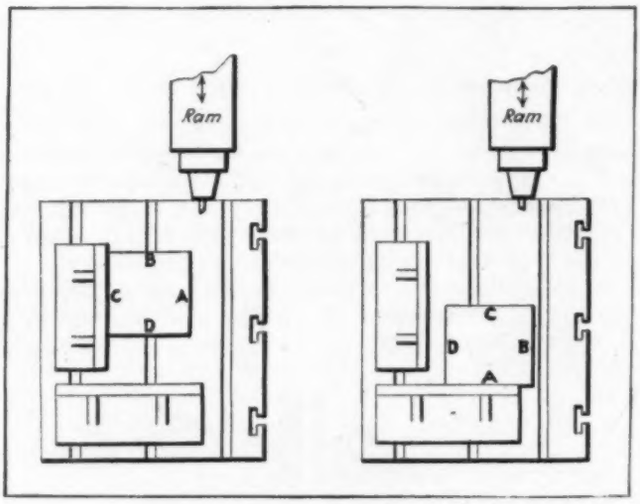

Fig. 5—Discarding the vise and using angle plates

must assume that the blocks are already in this stage, besides being roughed out within 0.012 in. or so on the edges. The top of the platen should be tested for parallelity with the horizontal travel and if not true a skin cut should be taken over it after the ways are cleaned and the gibs tightened.

The platen being true, we can clamp two angle plates at right angles to each other. Right here we come to a point where there are right angles and right angles. The plates themselves should be 90 deg. tested with a known square, but the "right-angles-to-each-other" feature, can be effected with an ordinary combination square. The same holds true when I state that one of the plates should line up with the stroke of the tool. There is nothing fussy about that line-up, as we shall see.

The one propounding the problem asks: "How can I know that the blocks are square instead of merely uniform?" Well, if he does trust a hardened square, he surely must be convinced by the absence of error.

The procedure would be as follows: Clamp the first die-block to the angle plate set parallel with the ram, and machine edge *A* as shown in Fig. 5. Then place edge *A* against the angle plate set crossways. After machining edge *B* place it, in turn, against the transverse angle plate. Then, machine edge *C* and *D* the same way. We can then check for accumulated error.

If the two angle plates are at right angles to one another, the die-blocks must necessarily be square. Theoretically only a single transverse angle plate is necessary, but the one parallel to the ram is needed to set the other one by and also to check the squareness of the block.

It is obvious that if two edges of the die block fit tight against the two plates, no matter how the block is turned, then the block must be square.

If there is any error, true up the crosswise plate and try again until it is square. After squaring the first one we can proceed with the others.

•

J. T. Towlson
London, England

The querist requires that the blocks shall be not only uniform as to size, but that they shall be mechanically square. This is understood to mean that each corner shall contain an angle of 90 degrees. It is assumed that it is intended to be a first class ordinary machine shop job, that the finished article as regards dimensions shall be simply subject to ordinary micrometer or vernier tests; and that the squareness shall be guaranteed by means of a good square and also by the means by which the machining of the second pair of sides of the steel blocks are done.

It is noticeable that the querist has set no limits of error, either as regards dimensions or squareness, and so long as a rough method such as trusting to the accuracy of the index of a swivel vice has been mentioned, we will assume that a limit of error of .001 in. both for dimensions and for squareness may be allowed. This is considered quite within the range of practical machining, and as near as is commercially practicable for a large quantity.

It is safe to assume that the ram and ram seat are at right-angles with the machine bed.

I would dispense with the swivel vise and lay the 8x8x1 in. blocks not on the shaper table, but with about a .005 in. thickness of paper at each corner, this to clear any possible roughness on the machine table. For the purpose of shaping the first two sides, I would bolt a machined strip on the shaper table as shown in Fig. 6, and place one side of the block against it and clamp it down, leaving two sides clear for machining by moving the head over.

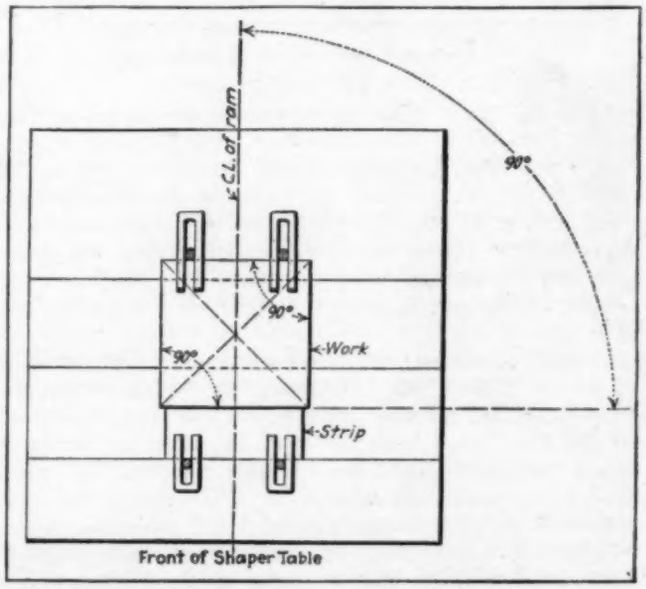

Fig. 6—Using a single stop on the shaper table

Having machined all the block in this position, I would overhaul the position of the shop strip before referred to for the purpose of machining the second pair of sides. The correct fixing, as regards being at 90 deg. with the ram, is the essential factor for squareness of the finished blocks, and on this correct fixing I would be more ready to depend than on the best square that ever was made. To test the parallelism of the strip with the shaper bed, grip a dial indicator in the tool post of the shaper so as to enable the dial indicator to function, tighten up the ram by the screws provided for the purpose and run the saddle up and down the shaper bed and adjust the strip until it is as nearly parallel with the bed, as the indicator can guarantee.

The strip being parallel with the bed, all is plain sailing for shaping the second pair of sides square with the first pair.

Should the querist desire a test, and not be inclined to use a square, let him measure the finished blocks diagonally across corners.

•

D. A. Baker

Assuming that your correspondent has planned the bed of the vise and the stationary jaw square with each other, it is natural to further assume that he will first plane the two larger surfaces flat and parallel with each other, as if this is the case he will then be able to turn the pieces up edgeways and plane two edges parallel. Having gone this far it only remains to square the other two edges. At this stage he has the choice of either setting the piece up on its edge or of laying it down flat, in this latter case his assumption that the graduations on the swivel vise of a shaper are not sufficiently accurate is perfectly true, if he expects to do as accurate work as the machine should be capable of.

The problem then, is merely one of setting the vise so that the stationary jaw is at right angles to the stroke of the shaper. The best method that I know is as follows: Referring to Fig. 1, take a try-square and place the base of it between the jaws of the vise and clamp it as shown, then with an indicator clamped in the tool post of the machine the ram can be moved back and forth by hand, while the indicator against the square blade will indicate which way to turn the vise for the correct setting. A final check-up should be made after the vise is clamped solidly in position.

If it so happens that an indicator is not a part of the tool equipment, then I suggest that a piece of steel be clamped in the tool post and tissue paper used between it and the square blade at both ends of the stroke to test the proper alignment. This should be just as accurate as the indicator, in the hands of a careful man, though it will necessarily take a little more time and patience. It should check the setting to within less than 0.0005 in. which is as close as can be expected for shaper work.

With the shaper vise trued up as described, the next step is to lay the work down flat on the bottom of the vise, or on suitable parallels, and then plane first one edge, then reverse the piece and plane the other.

If the machine is an accurate one, that is, if its table is at right angles to the stroke of the ram, the square clamped in the vise may be dispensed with and the indicator or other means may be used against the stationary jaw. The ram should remain stationary, while the table is fed forward and back by hand at right angles to the ram until the desired setting has been found.

I note what our correspondent says in regard to there not being room for a square on the bottom of the vise. If he desires to make his final cuts with the blocks standing on their edges, then the practical way of squaring them up will be as shown at Fig. 2. Here, a square is clamped to one of the already finished edges as shown, the work placed in the vise and lightly clamped, then with an indicator or other means as previously described the edge of the square can be aligned with the stroke of the machine in the same way that was used in squaring up the vise jaws. This method, however, has the disadvantage that it requires a separate set-up for each piece, also, since there is a natural tendency for shaper work to spring away from a cut, a slight error might arise from this springing.

For a final check on the parts, two of them should be stood on their edges on a surface plate or other accurate flat surface and their edges brought together. If there is any error, turning one of the pieces end for end will magnify the error, and if a check has been kept as to the position of the pieces in the shaper the error may be readily corrected by resetting the machine to compensate for it.

•

James Cornelius
Coventry Works, England

I am of the opinion that to obtain a perfectly squared job, the vise should be discarded, as really, only work that can be done in one chucking can be machined accurately when held in such fixtures on a shaper or planer.

My method is as follows, and it not only provides

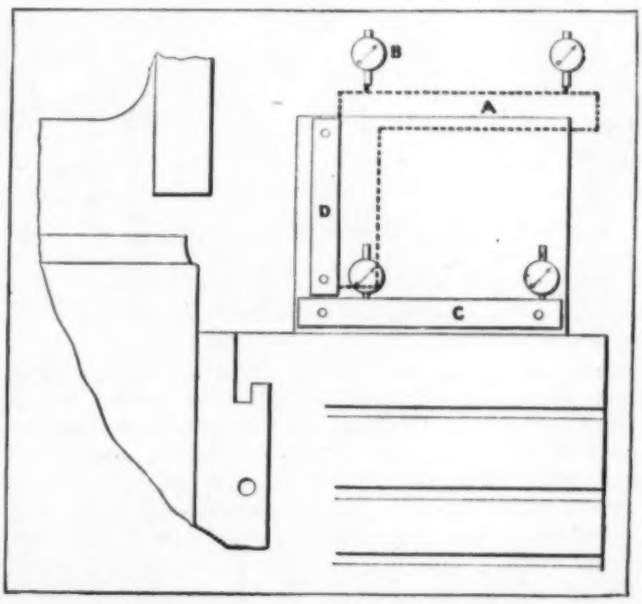

Fig. 7—Testing the strips before and after drilling

means of producing accurate work, but also of finally proving that the finished piece is perfect, and not merely uniform with others.

The tools required are, as shown in Fig. 7, a perfectly accurate flat steel square *A*, a dial indicator set for lathe tool post *B*, two perfectly flat steel locating strips

about 10x1½x½ in. *C*, and 6x1½x½ in. *D* respectively, and a 90-deg. angle face plate about 12x12x12 inches.

Proceed as follows: Take a truing cut across the shaper table if the latter shows any error when tested with the dial indicator. Assure that the angle plate is not damaged, and if so take a cleaning cut over both faces as nearly square as possible. Set the angle plate as shown in Fig. 7 and assure that the locating face for the job is at right angles to the plane of the tool travel. This is done by clamping the square to the face as in Fig. 8, and running the table along while the pointer of the indicator is in contact with the top side of the square. The face plate should be packed up carefully until there is no deflection of the needle. The face of the plate being now square, the longer of the two flat locating strips *C* is clamped near the bottom of the plate on the front face. By means of the indicator, test the top face of this strip for parallelism with the tool point. The shorter of the two strips *D* is now clamped at right angles to the longer one, and tested for squareness by means of the indicator and the square.

If the two strips are securely dowelled in this position and finally re-tested for accuracy, we have a perfect location to commence the job. This arrangement is

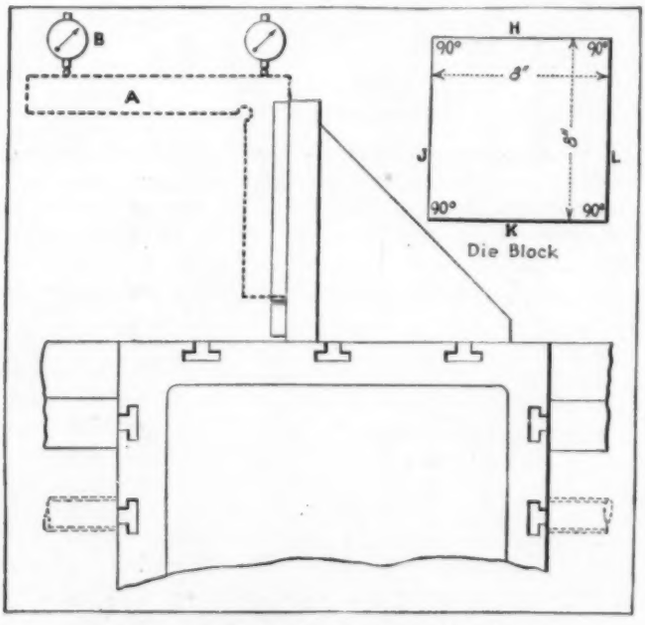

Fig. 8—Method of testing the angle plate

shown clearly in Fig. 7. The side *H* of the die block, is first cleaned up properly, and then located on the strip *C* of the set up. The side *K* may now be machined parallel to *H* without difficulty. Next, locate either side *H* or *K* on the strip *D* when side *J* or *L* can be machined square to the already finished sides. By turning the job, the remaining side may now be machined to finish the piece. The accuracy of the machining may be proved by replacing the tool by the test indicator, which can be used to test the accuracy of the top and bottom sides by means of the extension arms usually supplied, and the two sides by means of the square. With a little care absolute accuracy may be obtained.

The locating strips are made thinner than the job to facilitate the final testing for accuracy.

The remaining three answers to this problem will appear next week.

SEEN AND HEARD

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Metal-Destroying Insects

TERMITES and other wood-borers we have heard of in profusion, but a story about insects capable of attacking metal is included in the October issue of "Engineering Progress," a German metal-working review. Two species of these metal-cutters were discovered, one common larder beetle, the other a black beetle imported into Germany from South America. Each is about $\frac{5}{16}$ in. in length. These beetles, placed in test tubes with 0.008-in. sheet lead for caps, perforated the covers and escaped in from 2 to 4 hours. When several were placed together in a leaden box, they relieved each other at the work of escaping, just as human prisoners do. Perforation was accomplished by pinching off particle after particle of metal.

When faced with the task of cutting through 0.008 in. of tin, the beetles required about nine times as long to cut through. Annealed aluminum, zinc, and brass resisted their efforts. Other insects, such as the California lead-borer or "short-circuit beetle," wood wasps, and white ants, attack lead cables and conduit, but cannot attack other and harder metals.

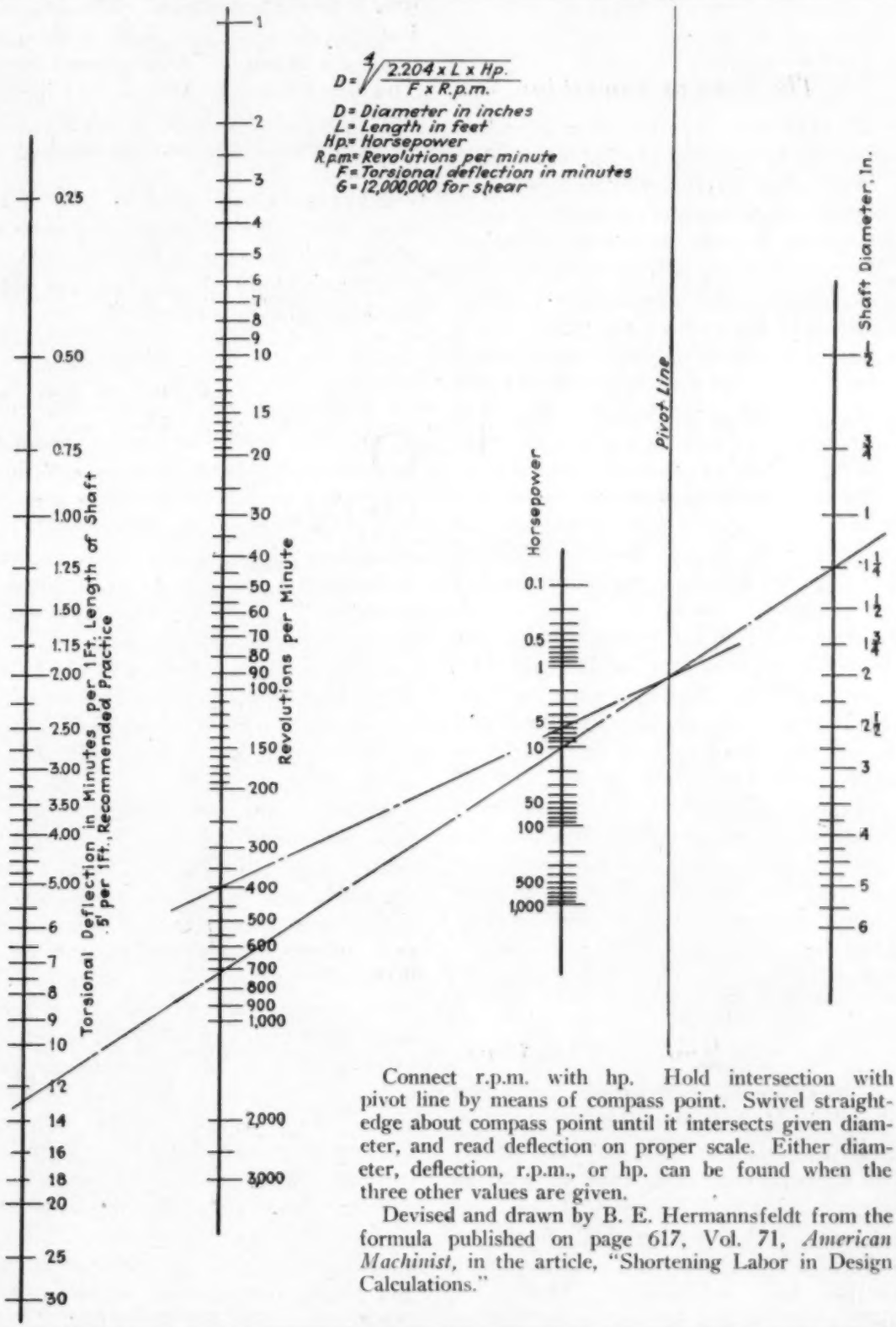
Drills and Darning Needles

WE HAD been talking of drills and drill grinding—my lathe-building friend of the Nineties and I. "Say," said he, "Do you know what we used to do back in '91 and 2? I was telling a drill salesman about it a couple of weeks ago, the young squirt wouldn't believe me. We used to buy drills just once a year—maybe $600 to $800 worth at a time—and $600 would buy a lot of drills in those days. We always specified that one in every ten be 0.01 in. undersize—for drilling holes to be reamed afterwards. We didn't have a drill grinder in the shop—did all our grinding by hand—and how were we to know that that one-hundredth of an inch was lost after the first grinding? A man with a pair calipers was exceptional, those days. Why, I even remember going out many a time to get darning needles of a certain size—yes sir—darning needles, to be flattened out for drilling small holes!" —*T.*

Proper Grinding Speeds Production

We've been preaching the grinding of tools in the toolroom, and by a competent man, for many years. This is particularly necessary with milling cutters and other special tools. But I never realized how necessary this was until the other day when a milling cutter expert assured me that a difference of *one degree* on the cutting clearance of a cutter may reduce its efficiency from 30 to 40 per cent. Even if he was overenthusiastic and it only cuts the efficiency 15 to 20 per cent, it proves pretty conclusively that it pays to have a thoroughly reliable man on the cutter grinding job. —*J. R. G.*

Drive Shaft Twist Calculation Diagram


$D = \sqrt[4]{\frac{2.204 \times L \times Hp.}{F \times R.p.m.}}$
D = Diameter in inches
L = Length in feet
Hp = Horsepower
R.p.m = Revolutions per minute
F = Torsional deflection in minutes
6 = 12,000,000 for shear
Torsional Deflection in Minutes per 1 Ft. Length of Shaft
.5° per 1 Ft., Recommended Practice
Revolutions per Minute
Horsepower
Pivot Line
Shaft Diameter, In.

Connect r.p.m. with hp. Hold intersection with pivot line by means of compass point. Swivel straightedge about compass point until it intersects given diameter, and read deflection on proper scale. Either diameter, deflection, r.p.m., or hp. can be found when the three other values are given.

Devised and drawn by B. E. Hermannsfeldt from the formula published on page 617, Vol. 71, *American Machinist*, in the article, "Shortening Labor in Design Calculations."

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American Machinist

Editors: KENNETH H. CONDIT AND FRED H. COLVIN

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VOL. 73 NO. 25

The Lure of Something New

GOSSIP, rumors, reports from random sources are notoriously unreliable. And it is to be hoped that certain reports persistently flowing from automobile centers are equally unreliable and untrue. If true, the movement toward general business recovery will be retarded; the automobile business, as the largest industry, affects more people, more purses than any other.

In a word, the automobile builders are reported as determined to continue present models through the coming year with few changes other than essential refinements. Since the expense of large-scale retooling will be eliminated, they seem to plan to offer their wares at reduced prices.

On the face of them, such plans would seem to be conservative, constructive—just the things to do, under "the conditions"; but unfortunately the reverse is true.

If the automobile builders do not redesign and retool, engineers, machine tool builders and dealers, and automobile builders themselves, will all be losers. If brand new models are not offered, the public will undoubtedly decide that bottles of body polish are far less expensive than new old models, even at reduced prices. Americans are a youthful race and a resilient race. They cannot be depressed for long; sooner or later their money burns holes in their pockets; they have never failed to respond to the lure of "something new"—and, bless their erratic souls, they never will.

Quicker Than Books

GOLF champions do not happen overnight. Neither do skilled operators, set-up men, maintenance men, and shop executives. There can be no substitute for long training with an early start.

First there should be a background. Books can provide the future mechanics and executives with much of their basic information. Movies or, better still, actual models of mechanical devices and machines afford a much quicker and surer visualization. Which brings us to the subject of industrial museums.

We are beginning to have real museums in this country. The Smithsonian in Washington is a time honored institution. The Museum of the Peaceful Arts in New York is devoting its energies to industrial developments of all kinds. The new Rosenwald Museum in Chicago and the Franklin Museum in Philadelphia will serve a similar purpose in those cities; and we shall have others.

Educators along industrial lines, and manufacturers who will need skilled men more and more, will do well to count on the industrial museum as a vital part of the education of boys and girls who will later go into industry.

Research

ON THE PART of some of the smaller manufacturers there appears from time to time a tendency to fear their larger competitors for their research facilities. White-tiled laboratories, mysterious apparatus, serious young men in owl-like spectacles, all serve to create illusory feelings of inferiority in those who try to differentiate research from their own intelligent, businesslike tinkering in obscure corners of their shops. One who does not allow himself to be carried away by outward manifestations defines research as "tinkering that has been to college." And he is not so far wrong at that.

Whatever the feats of modern research, one must not forget the humble birthplaces of the electric motor, the electric light, the automobile, the airplane.

One must remember with Charles M. Schwab that, "Common sense and the rule of thumb are essentially just as valuable today as ever, for we have combined the experience of thousands of rules of thumb into scientific principles." If a plant can afford the conveniences and luxuries of a private laboratory, well and good; if a plant cannot, the lack need be no bar to genuine inventive creation and progress. With his lighter carrying charges, the smaller manufacturer has a definite advantage today; where he needs more research or tinkering facilities than his own shop affords, he can find competent industrial research and testing laboratories, organized and waiting for him in almost any major city.

SHOP EQUIPMENT NEWS

Velefor No. 2, Six-Slide Heavy-Duty Automatic Press

For both large and small quantity production, the Velefor Press Works, 2126 Stanley Terrace, Union, N. J., is introducing a No. 2, 6-slide heavy-duty automatic press. The heavy ram and bolster with the flywheel arrangement resemble a heavy-duty press for blanking and piercing. The straightener, feed with check, cut-off mechanism, four forming slides, and the stripper are somewhat similar to a heavy-duty press for forming. Both units are timed together so that punchings of complicated forms can be produced in one stroke, using standard cams.

The press can be operated with a single stroke for small quantities, using strip material, thereby reducing the cost of tool equipment such as forming dies, which are replaced by simple forming blocks. A saving in labor is also achieved, inasmuch as all work necessary on the standard punch press after the first operation is eliminated. For large quantity production, reel material on the automatic feed can be used while running the press continuously. Additional savings are made because of the increased rapidity of action. Setting up of the press is less difficult than setting up a progressive die, and the machine can be run by unskilled labor.

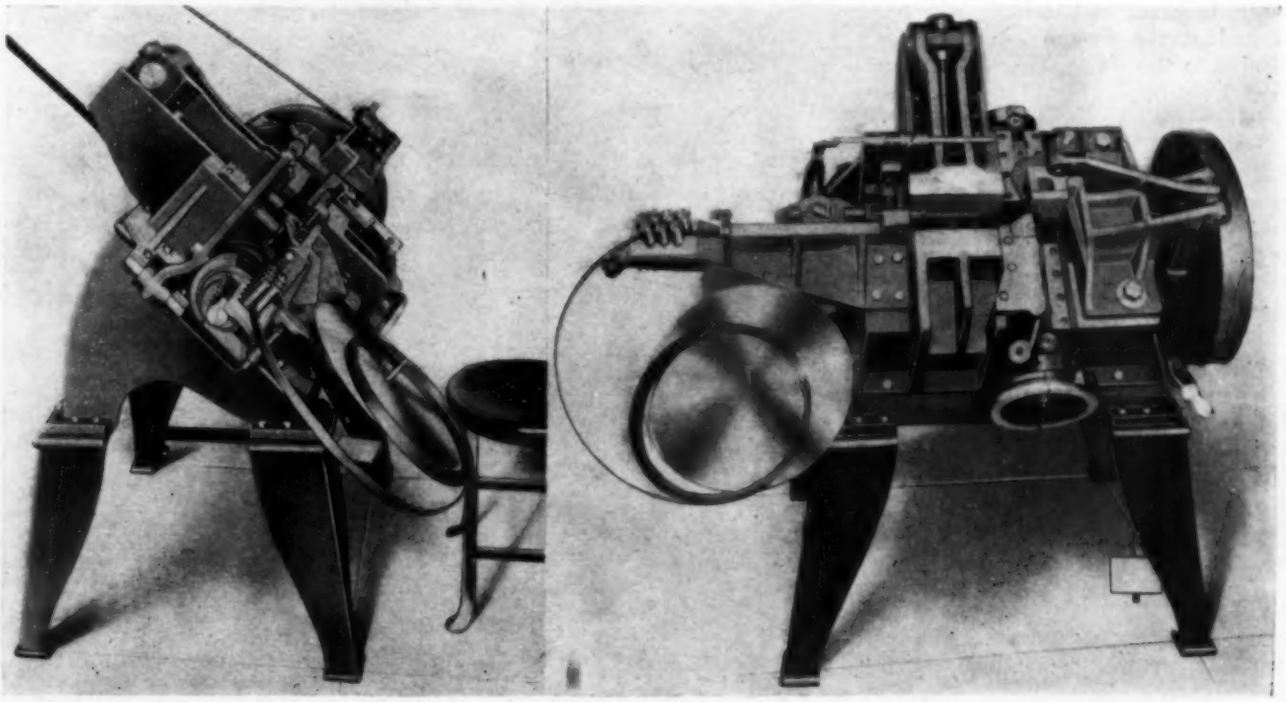
All slides in this press are at least three times as long as they are wide and they extend close to the working edges. The ram is tapered. When blanking or piercing, the ram has 0.0015 in. clearance and when it is on the up stroke, the clearance is 0.004 in. The feed can be set by a micrometer adjustment. Loose play in the feed elements and variation in material to any degree does not affect the accuracy of the feed, which can be set to 0.0005 in. The check regulates itself automatically to any length of feed.

The drums can be shifted to any position. Cams can be replaced without disassembling any part of the machine. Cam rollers have double supports. All main bearings and all slides have felt lubrication. A large number of punchings can be obtained between grindings, and the cams are inexpensive and can be replaced easily.

Specifications: Capacity of ram, 10 tons; capacity of slides, 1 ton; largest width of strip, 2 in.; largest stroke of feed, $4\frac{1}{2}$ in.; ram stroke, $\frac{1}{8}$ in.; cut-off slide stroke, $\frac{7}{16}$ in; stroke of front and back forming slides, $\frac{3}{4}$ in.; stroke of side forming slides, $1\frac{1}{4}$ in.; power required, 2 to 3 hp.; weight, 1,600 lb.; and floor space, 42x60 in.

Watson-Flagg Front Gear Motors

Helical-gear reduction units are built into the end shield of a standard electric motor to form front gear motors, a product of the Watson-Flagg Machine Company, 107 Nineteenth Ave., Paterson, N. J. Except for a very slight increase in overall length, together with a larger shaft

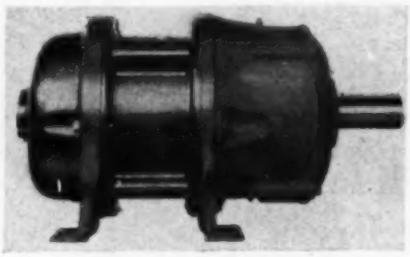


Blanking and forming of strip stock up to 2 in. wide can be handled on the Velefor No. 2, 6-slide heavy-duty automatic press. These views show the convenient operating characteristics, the slides, and the ram, which is rated at 10 tons

diameter than usual, because of the lower speed involved, the combination is practically the same in appearance as the motor alone. The wide-spread, double-bearing supports for the output shaft extension permit the application of these units on overhung load conditions, such as V-belt or roller chain take-offs, in addition to the usual coupling connection.

The front gear motors are equipped with anti-friction bearings throughout, and are dust-proof and oil-tight. Standard N.E.M.A. motor frames are employed, and the combination is entirely supported on the regular motor feet. No unit bedplate is required.

These front gear motors are available for any speed motor from 3,600 r.p.m. down and from $\frac{1}{6}$ to 30 hp. Stock ratios are $11\frac{2}{3}$:1, 11:1, $10\frac{1}{3}$:1, 9:1, 8:1, 7:1, 6:1, 5:1, and 4:1.



Watson-Flagg Front Gear Motor, which employs a standard N.E.M.A. frame and built-in helical-gear reduction

Société Genevoise Model MP-3C Toolroom Jig Boring Machine

Guaranteed accuracy of the table and boring head slide movements is ±0.0002 in. for the model MP-3C toolroom jig boring machine introduced into the United States by the R. Y. Ferner Company, Investment Bldg., Washington, D. C. This machine, manufactured by Société Genevoise d'Instruments de Physique, Geneva, Switzerland, was exhibited at the Power Show. It is similar to the other sizes of the line in that the boring head is mounted on a slide which moves horizontally on a cross-rail, supported by two upright housings, while vertical movement of the rail is accomplished by two vertical screws. Accurate measurements are obtained by the use of micrometer leadscrews for moving the boring head and the table.

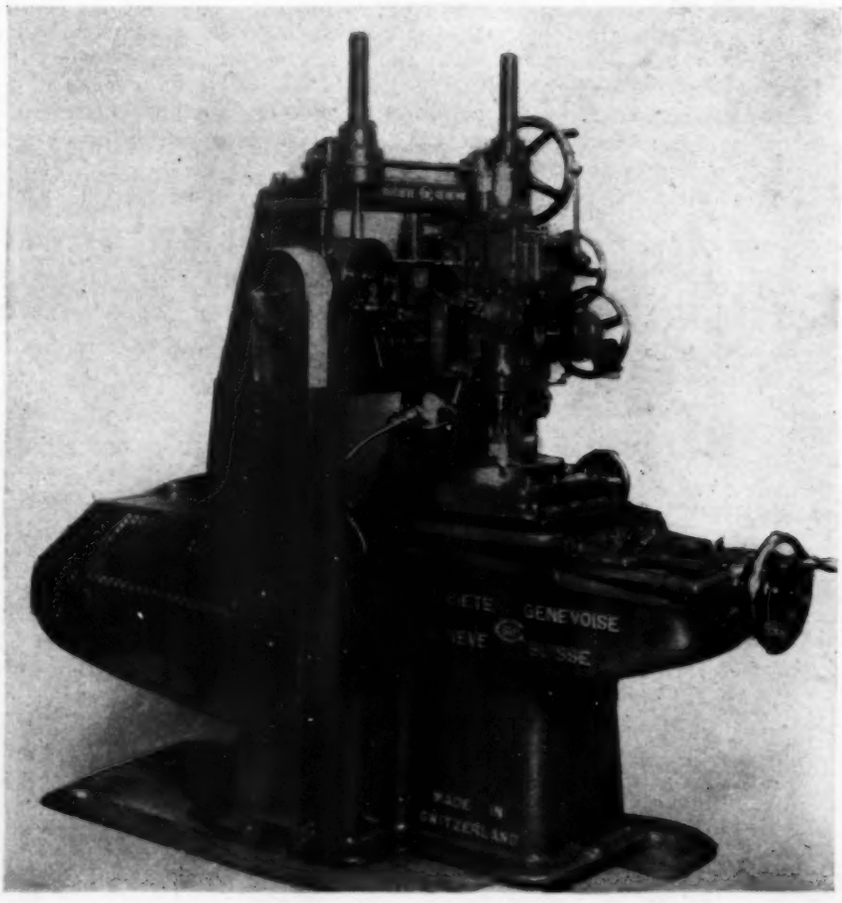
The machine is especially suitable for instrument making, die making, construction of small jigs and fixtures, model making, and development work. It is also useful in the shop as a general measuring machine for the accurate checking of distances between holes or their distance from the edge of a job.

By the use of curved templets attached to the table and the cross-slide, the leadscrews are compensated for any small errors which remain after lapping. The lever system used for transmitting corrections to the vernier indexes of the micrometer heads is somewhat different than in previous models. Through this templet and lever system, the errors are transferred to the micrometer index, shifting the latter back and forth slightly to place it in the correct position and allowing for the errors at any point on the screw. This method achieves the above accuracy.

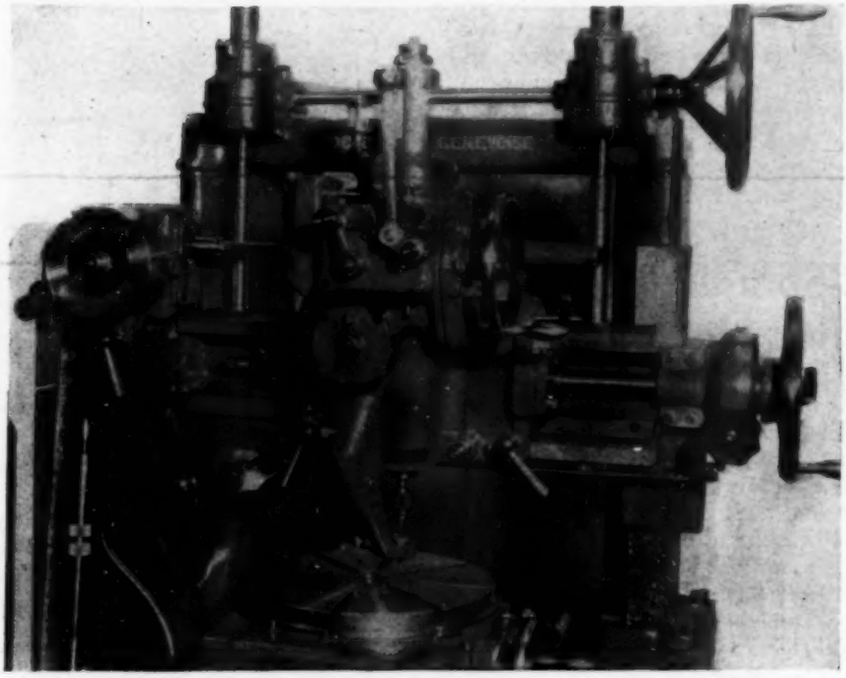
The table area of the model MP-3C is 15x20½ in. Free distance between the uprights is 23¼ in., nearly twice the transverse motion of the boring head, which is 12 in. The table can be moved through 18 in., so that holes can be located, drilled and bored anywhere within an area of 1x1½ ft. without resetting the work.

Vertical travel of the cross-rail is 9½ in., which, with a minimum distance from the table to cross-rail of 5 in., gives a maximum vertical capacity of 14½ in.

A 1-hp., two-speed motor attached to the rear of the machine furnishes



Société Genevoise Model MP-3C Toolroom Type Jig Boring Machine, which has a guaranteed accuracy of the leadscrews of ±0.0002 in., a table area of 15 x 20½ in., vertical capacity of 14½ in., and capacity to drill 1-in. holes in cast iron



Close-up of Société Genevoise Model MP-3C Jig Boring Machine, showing spindle control, and the holder for guide bushings when drilling small holes

power to a 4-speed gearbox of special box. It is possible to obtain eight speeds for the spindle, varying from 135 to 1,500 r.p.m. The machine is therefore suitable for drilling and boring very small holes, as well as having capacity for drilling in cast iron up to 1 in. and boring to 2¼ in. Two rates of power feed of the spindle are provided—0.004 and 0.008 in. per revolution. Hand feed of the spindle per revolution of the handwheel is 0.10 in.

For drilling small holes, ¼ or $\frac{5}{16}$ in., a holder for guide bushings is supplied. This holder can be attached readily to the boring head in such position as to hold the guide bushing at the lower end of the drill to keep it from vibrating. Leadscrews of the machine have five threads per in. The micrometer head is divided into 400 divisions, so that each division is 0.0005 in., and verniers for each micrometer head can be read to 0.00005 in.

A circular table can be furnished with a diameter of 13¾ in., and a height of 4⅛ in. The drum on the worm screw of this table is graduated to 30-second intervals, and by the vernier angular settings can be read to 5 seconds of arc. The accuracy of the circular table, therefore, corresponds closely to that of the settings of the rectangular table and cross-slide. The table is centered in the axis of the spindle by use of a centering dial indicator furnished as one of the accessories.

Other accessories include a centerpoint for the spindle, which is useful in tapping very straight holes. A locating microscope and a reference square for use with it are supplied to aid in placing the axis of the spindle exactly over the edge of a job or for sighting on any specified point. An adjustable boring tool of 2¼ in. capacity is also supplied, as well as two guide bushings for drilling and reaming ⅛-in. holes, an endless belt, and a set of wrenches. An adjustable electric light can be attached to the machine and used for illuminating the work.

Net weight of the model MP-3C is about 2,160 lb., not including the motor or the circular table, the latter weighing 50 lb. The machine is 6 ft. 4 in. high, has an over-all length of 58 in., and a width of 51 in.

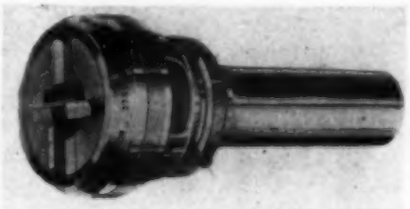
Starrett "Semi Flex" Hacksaw Blade

Easy and rapid cutting of pipe, tubing, wire, cable, electrical conduit, BX cable, and soft or thin materials is afforded by the "Semi Flex" hacksaw blade announced by the L. S. Starrett Company, Athol, Mass. The "Semi Flex" hacksaw blade, as the name implies, is flexible, and therefore can be used on jobs that strain or twist the blade without fear of breaking. It is made of tungsten steel.

Gairing Inserted-Blade Hollow Mill

A combination or two-purpose tool for hollow milling and facing has been developed by The Gairing Tool Company, Detroit, Mich. This hollow mill is made with greater production capacity for machining bar stock, castings and forgings and is made rigid for heavy-duty work. By simply rotating the cone-shaped external nut, which has a direct bearing on the outer edge of the blades, blade adjustment is obtained. This feature saves time. The external cone-shaped nut is graduated in thousandths to give any required diameter.

The blades have a positive lock secured firmly in the body and are of such construction that tilting is eliminated on heavy-duty work. The blades are interchangeable. Sufficient strength is obtained by this blade setting to utilize Stellite or



Gairing Inserted-Blade Hollow Mill, which is made in eight sizes for diameters from ½ to 2 in.

cemented tungsten-carbide, although high speed steel blades with the decarbonized surfaces removed are supplied as standard.

Correct cutting angles on the blades and proper spacing for different kinds of metal have been incorporated so that the tool will be applicable for straight or taper surfaces and facing operations. Blades can be formed or ground to any angle. The body of the mill can be made for multiple cuts or equipped with drills, reamers, or

multiple-operation cutters. Pilots can also be inserted in the mill for facing and spot-facing operations. Bodies are casehardened.

This hollow mill is made in eight sizes for machining diameters from $\frac{1}{8}$ to 2 in., and can be made specially for any diameter with any number of blades. Morse taper or straight shanks are optional.

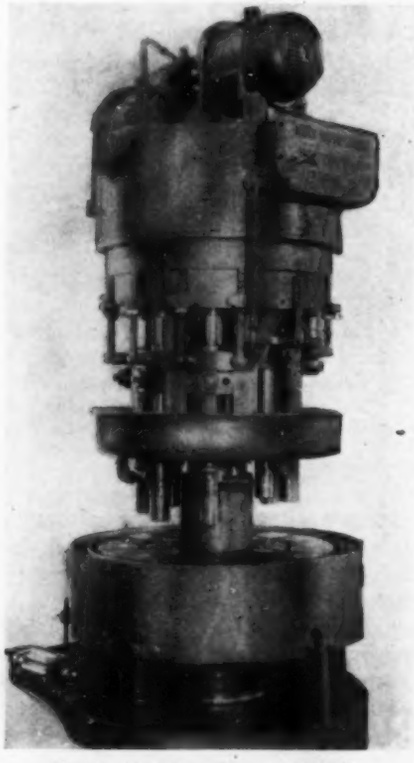
Davis & Thompson 8-Spindle, Upright Continuous Drilling Machine

Ball bearings are employed throughout the 8-spindle, upright, continuous drilling machine announced by the Davis & Thompson Company, 57th Ave. & Mitchell St., Milwaukee, Wis. The machine is lubricated automatically and the spindles raise and lower automatically. The flexible cam that passes around the machine is adjustable, so that the depth of the hole drilled can be adjusted. Rotation is stopped and started by a hand lever operating a friction clutch. Spindle speeds range from 50 to 700 r.p.m., and pick-off gears govern the speed changes.

The machine is equipped with a conveyor for conveying the chips out of the pan. A wiper brushes the chips into a hole, causing them to fall in the conveyor. A tank in the base is used for coolant, and the tank around the machine is a reservoir for lubricant. Cutting compound flows on the parts to be drilled by gravity and not under pressure. The spindles are adjustable up and down by a rack and pinion key.

Table slots are for $\frac{5}{8}$-in. bolts, and a center guide is bored in the table for locating the fixture. Holes between the tables and openings in the table allow chips to pass into the pan. The guard around the machine is removed easily and can be raised or lowered to suit the operating condition.

The machine can be set up as quickly as the ordinary gang drill. When the cam is adjusted for one spindle, it is adjusted for all. Quills are all hardened and ground. The machine has a capacity of $\frac{5}{16}$ to 2 in.



Davis & Thompson 8-Spindle Upright Continuous Drilling Machine, having drilling capacity from $\frac{5}{16}$ to 2 in. at each spindle

"I-C" Manual Starter with Push-Button Reset

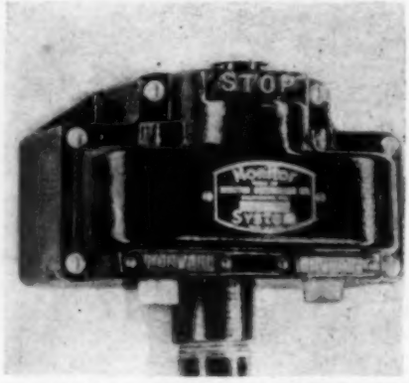
All poles of the Class 2510 manual starter, introduced by the Industrial-Controller Division, Square D Company, Milwaukee, Wis., are opened simultaneously with the tripping of either of two relays. The thermal overload relay used is the same type employed on the automatic starters manufactured by the company. The starter is reset for operation by pressing the button extending through the front cover. Another feature is the trip-free handle, which prevents blocking of the switch closed against an overload. As the starter is operated entirely from the front, it may be mounted in pairs or groups on a pedestal or a wall without waste space.

The three-phase ratings of this starter are: 5 hp., 220 volts; and $7\frac{1}{2}$ hp., 440-550 volts. It is suitable for pumps, portable conveyors, fans, and other applications where low-voltage protection is not required.

"I-C" Manual Starter with Push-Button Reset

Monitor Push-Button Master Station

An ironclad push-button master station has been added to the line of the Monitor Controller Company, Baltimore, Md. It is available for use in either a.c. or d.c. circuits to provide forward and reverse momentary contact control, and is particularly suited to machine service. This reversing station has massive and flexible contacts. The forward and reverse buttons are in a protected position at the bottom, and the stop button is placed at the top where it is



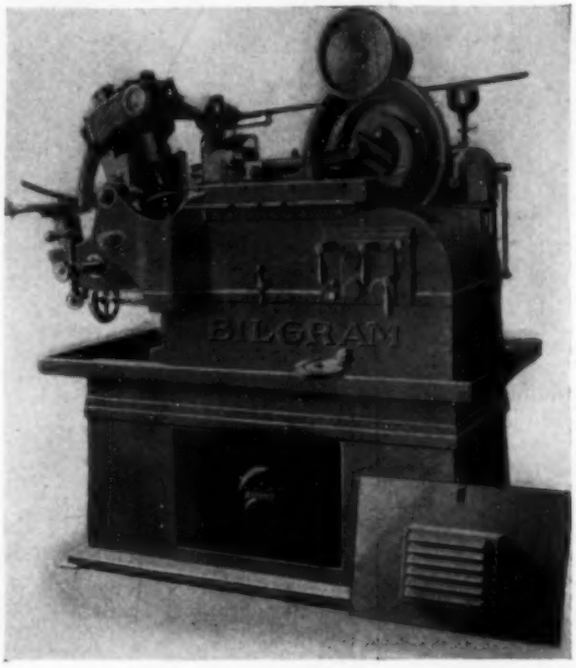
Monitor Push-Button Master Switch, providing momentary forward and reverse contact control

easy to operate. This arrangement is adapted to give quick-action inching in either direction. Fixed contacts and wiring are carried in the base; the push buttons in the cover.

Bilgram Bevel Gear Generator

One of the machines exhibited at the Power Show was the bevel gear generator announced by the Bilgram Machine Works, Inc., 1217-35 Spring Garden St., Philadelphia, Pa. This type of machine indexes for the next tooth during every return stroke of the tool, thereby producing bevel gears with uniform teeth. The machine is flexible and easy and quick to set-up. Eight speeds are supplied for 14½- or 20-deg. pressure angles, or both, if desired. Bevel gears are planed accurately and economically of any pitch diameter or any fractional pitch up to 5 D.P. in steel, and up to 1 in. circular pitch in cast iron, of any ratio up to 6:1.

The illustration shows the 6-in. machine for belt drive. The motor-driven machine requires floor space of 36x61 in., the net weight is 2,750 lb. For belt drive the floor space required is 36x73 in., and the net weight is 2,740 lb.

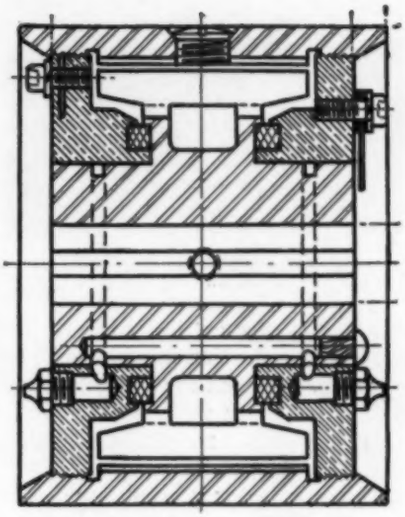


Bilgram Bevel Gear Generator for steel gears up to 5 D.P.

Hill-Pulvis Centrifugal Clutch

Sure, gradual power transmission by centrifugally increasing density of graphite-treated chilled shot against a driving and a driven element is the principle employed in the Hill-Pulvis clutch announced by The Hill Clutch Machine & Foundry Company, Cleveland, Ohio. This type of clutch can be applied to individual drives, either as a motor pulley, V-belt sheave, gear or sprocket, or as a coupling on direct-connected drives.

Referring to the illustration, the winged rotor is the driving element and the serrated shell is the driven element. Wings are provided with orifices to distribute the chilled shot evenly, thus effecting dynamic balance during its operation. When the line switch is closed, the driving motor comes immediately up to speed. The winged wheel turns at the same speed and rotates the charge of chilled shot. The rotating rotor wings set up centrifugal action, forcing chilled shot out against the serrated inner surface of the shell. The chilled shot mass packs tightly and assumes a definite position in front of each wing. Power is transmitted in gradually increasing amounts until the maximum is reached without loss to the driven element. Every clutch is equipped with a "tell-tale" device that indicates duration of starting time and shows overloading.

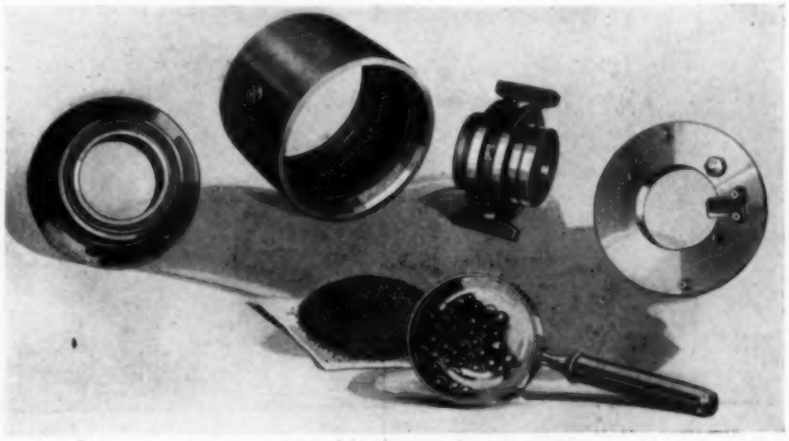


Sectional view of Hill-Pulvis automatic clutch pulley

Both starting characteristics and driving power can be changed in the same clutch by changing the quantity of chilled shot.

Disston Inserted-Blade, Metal-Cutting Saw

An inserted-tooth, circular, metal-cutting saw, known as the "Improved Interlocked," has been announced by Henry Disston & Sons, Inc., Tacony, Philadelphia, Pa. This saw makes a draw cut instead of a thrust cut. The teeth are set in the blade at an angle



Components of the Hill-Pulvis clutch, which employs chilled shot as the driving medium

Disston "Improved Interlock" Metal-Cutting Saw

that brings the cutting edge of the tooth on a radial line, so that the tooth is drawn or pulled through the metal instead of being pushed through it. This principle results in easier, smoother, and faster cutting.

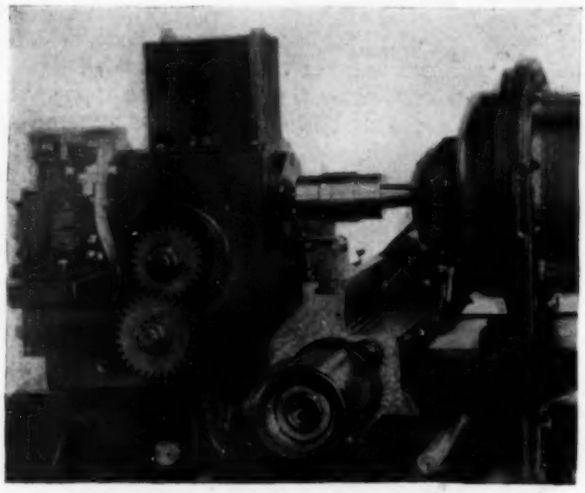
This saw is for general work, particularly large rounds and sections. The company is producing them in all wanted diameters, with various spacings of teeth.

Electric Threading Attachment for Goss & De Leeuw Multi-Spindle Chucking Machines

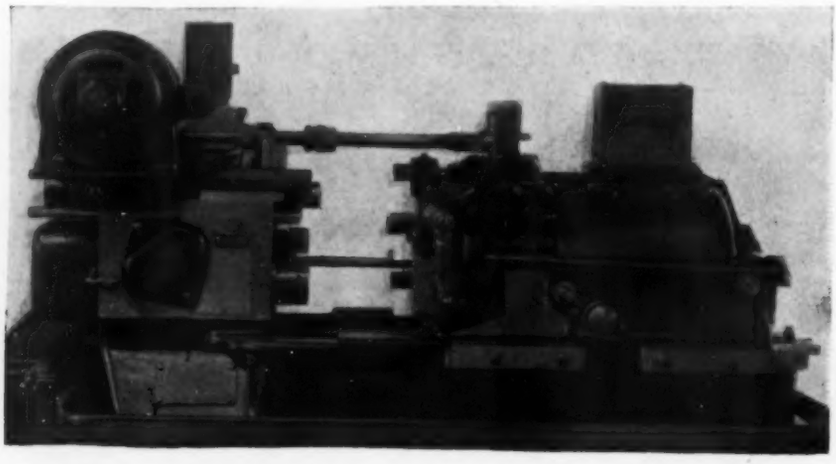
Electric reversing drive for the threading spindle of its multiple-spindle chucking machines has been announced by the Goss & De Leeuw Machine Company, New Britain, Conn. The independent drive for threading spindle is furnished by a reversing electric motor, acting through a worm and worm wheel and pick-off gears direct to the spindle. Starting, reversing, and stopping of the spindle is only a matter of throwing an electric switch rather than operating a mechanical clutch. Reversing shock has been eliminated by the cushioning effect of the electric motor. Slippage has been entirely eliminated and more power can be transmitted. The instantaneous positive reverse gives assurance that the tap or die will always reverse at the same point, permitting threading close to a shoulder or a blind bottom. Higher spindle speeds can also be attained because of the absence of shock.

The operation is entirely automatic, the forward motion of the main slide throwing the switch into the forward position, and the mechanism itself operating the switch for reversing and stopping. All three points — starting, reversing and stopping—are adjustable. Pick-off gears give a wide range of speeds. The spindle feed is controlled by a positive leadscrew always in engagement with its leadnut. Two threads of different pitches can be cut simultaneously on the same spindle and both the right- and left-hand threads can be handled.

Either standard or high-starting torque motors for either a.c. or d.c. current can be used. The switch has been designed by the company and operates the control circuit in the standard reversing control box. Only 110 volts are impressed on the switch, as a transformer reduces the control circuit current to this voltage. Thus, switch troubles are minimized. A solenoid brake connected in the motor line operates automatically to stop the spindle and motor, preventing any coasting of the motor on the return cycle.



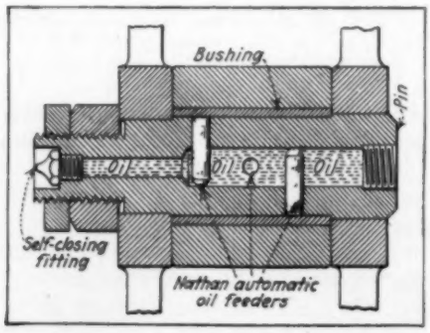
Reversing motor and pick-off gears giving a wide range of speeds to the threading spindle. The solenoid brake prevents coasting of the spindle



Goss & De Leeuw Multiple-Spindle Chucking Machine fitted with electric reversing attachment for the threading spindle, eliminating reversing shock and the use of clutches

Nathan Automatic Oil Feeders

For industrial applications, the Nathan Manufacturing Company, 250 Park Ave., New York, N. Y., is offering its automatic oil feeders. Oil



reservoirs are built into the parts equipped with this lubricating system. In the holes which connect reservoirs and bearing surfaces, oil feeds or plugs are fitted for carrying the oil to the bearing surfaces. They are made of specially selected wood, treated to feed oil from the reservoirs

in minute quantities to lubricate the bearing surfaces thoroughly. Sand or grit is prevented from reaching the surfaces, thus assuring long bearing life.

"Automatic" Time-Cycle Contactors

Automatic operation of various processing equipment can be controlled by means of the time-cycle contactors developed by the Automatic Temperature Control Company, Inc., 34 E. Logan St., Philadelphia, Pa. Such operations may include automatically advancing the load in a continuous type furnace, automatically timing material being heated or electro-plated, automatic lubrication, automatic operation of hydraulic presses, and many others. Contactors to meet these varied demands may be classified under two general groups: (1) Cycle repeating contactors, designed to repeat periodically the cycle so long as the line switch is closed, and (2) cycle stop contactors, designed to start from a push-button switch, run the time-cycle set, and stop until the starting switch is again actuated. Duration of the cycle may be a few seconds or several days.

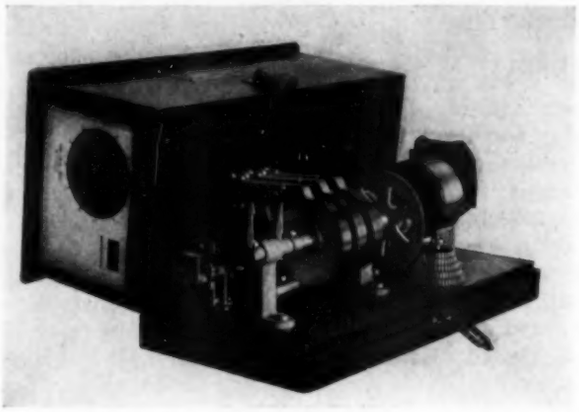


Fig. 1—"Automatic" Time Cycle Contactor designed to handle three contacts per cycle in desired sequence. The cycle may vary from a few seconds to several days

An example of the cycle stop type contactor is given in Fig. 1, this particular device being designed to handle three contacts per cycle in desired sequence. Accurate timing and necessary power for operation are obtained from a small synchronous motor, geared to the desired time requirements. Change gears permit altering the time of the cycle. Units of this type have been built with 11 contact disks and with a cycle of 96 hours, while others have been built with a cycle of only a few seconds.

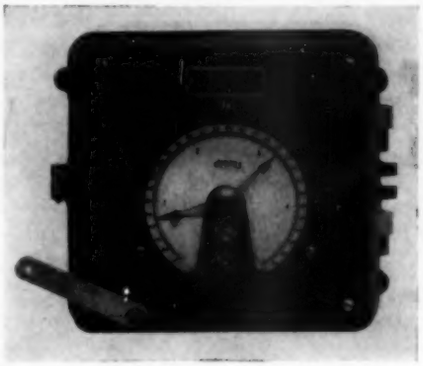


Fig. 2—"Automatic" Cycle Stop Type Contactor, which may be set by an adjusting knob to the elapsed time required

Another cycle stop contactor is shown in Fig. 2, but this model does not require change gears to alter the time of the cycle. Changes are made easily and quickly by means of an adjusting knob outside of the instrument case. This unit is built in both the cycle stop and the cycle repeating types. Standard full-scale ranges for this type of unit range from 1 min. to 120 min., and each scale division may range from 1 sec. to 30 sec. It is possible to set the high contact arm for any desired elapsed time within the full-scale range of the dial, and this setting can be made to a scale division or closer.

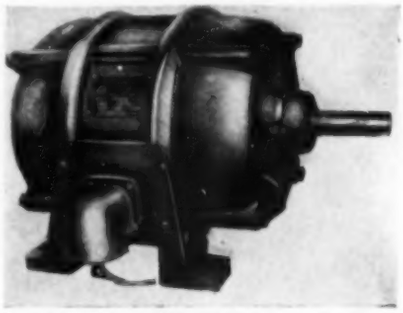
"Covulc" Self-Curing Plastic Rubber Compound

Repair and maintenance of equipment subject to extreme wear or corrosion can be effected with "Colvulc" self-curing plastic rubber compound manufactured by The Hitchcock Company, 48 Pearl St., Boston, Mass. It can be quickly applied and requires no heat nor pressure. It is supplied in paste form. One pound of "Covulc" will cover approximately 3 sq.ft., if spread to an average thickness of $\frac{1}{4}$ in.

Typical applications of "Covulc" are the resurfacing of conveyor belts and the covering of metal parts where corrosive or acid conditions exist. Exposure to air causes the material to cure. After vulcanizing, it remains soft and flexible. Articles to which the material is to be applied should be cleaned with a cleaning fluid supplied by the company.

"Ideal" Unit-Type Motors

Induction, squirrel-cage, slip ring, and d.c. motors, in all sizes and types from $\frac{1}{2}$ to 200 hp., are now available from The Ideal Electric & Manufacturing Company, Mansfield, Ohio, in unit designs. Standardization of these designs has permitted interchangeable rotors and stators. Thus, standard horizontal motors, shell-type motors, flange-type motors, vertical motors, and special applications of "built in" motors requiring only the active elements, all take the same rotors and stators.



Ideal Unit-Type Motor employing standardized stators and rotors to facilitate building open or closed types

These standardized units are used to build open-type motors; splash-proof motors, drip-proof motors, totally inclosed, fan-cooled motors with running seals or stationary seals, explosion-proof motors, and shaftless motors. Precision in manufacture assures proper alignment of all motors and replacement of parts when required. Sleeve bearings, shafts, stators and rotors and armatures are all ground to definite measurements with limit tolerances. Because of the unit type design active motor elements can be built in the machine at low cost and with only minor changes in the present machine.

Anti-friction bearings are supplied

as standard. They are of the cartridge type, and direct fittings with automatic seals are used to supply grease under pressure. Sleeve bearing housings can be rotated for wall or ceiling mounting without removing the bearing brackets. They can also be replaced without removing brackets.

Sutton No. 000 Round Straightening Machine

Hot-rolled, cold-rolled, and cold-drawn bars, tubes and pipes in both ferrous and non-ferrous metals can be straightened on the No. 000 round straightening machine developed by the Sutton Engineering Company, Park Bldg., Pittsburgh, Pa. The design employs eight rolls instead of five, and has a fully enclosed gear drive, anti-friction bearings and guides.

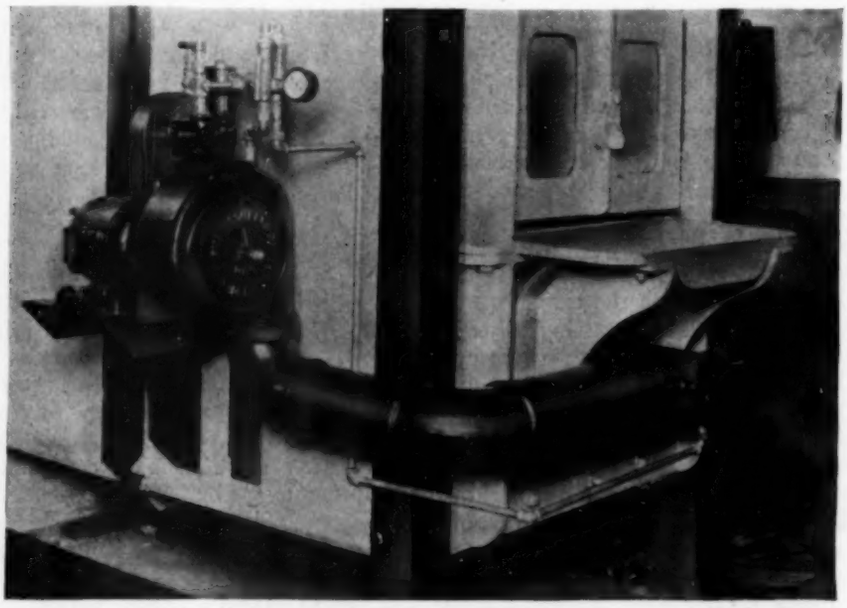
Three driven rolls and five idlers are provided instead of two driven rolls and three idlers as in the case of the other round straightening machines manufactured by the same company. Thus, two more straightening points are available, this being especially important when heat-treated materials are to be straightened. These additional rolls also produce a better polish, and more scale is removed from hot-rolled material. Capacity is from $\frac{1}{8}$ to $\frac{5}{8}$ in. O.D. at a rate of 150 ft. per minute.

All gears have cut teeth, and all bearings except those of the driven rolls are of the anti-friction types. Both the motor connection and drive connection are effected by flexible couplings. The machine is equipped with a complete set of guides. Floor space required is 3 ft. 2 in. x 2 ft. 3 in., and the weight is 1,040 lb.

Three driven rolls and five idlers permit straightening heat-treated stock on the Sutton No. 000 Round Straightening Machine

Ryan-Scully Model DI Automatic Oil Burner for Industrial Furnaces

Self-contained equipment for firing heat-treating or carburizing furnaces has been announced by Ryan, Scully & Company, 3711 Wissahickon Ave., Philadelphia, Pa., as the model DI automatic low pressure automatic oil burner. This equipment consists of a burner, blower, pump, strainer, regulating valves, atomizer, and complete automatic control assembled in one unit. It is offered to meet small furnace firing requirements and can be installed on standard one-burner heat-treating or carburizing furnaces.



Ryan-Scully Model D1 Automatic Low-Pressure Oil Burner, consisting of all necessary equipment in one unit

Sterling Motors with Herringbone Rotors

Motors from 1 to 50 hp. are now built by Sterling Electric Motors, Inc., Telegraph Road at Atlantic Blvd., Los Angeles, Calif., with herringbone rotors to achieve quiet operation. These motors therefore are suitable for such applications as ventilating fans, direct-connected pumps, or other application where quiet performance is important.

Among the features of these motors brought about by the herringbone rotor shown in Fig. 2 are: noiseless operation; no end thrust and resulting wear on bearings; no back and forth lateral pounding; no circulating currents; improved pull-out efficiency and power factor; and reduced starting current, heating, eddy currents,

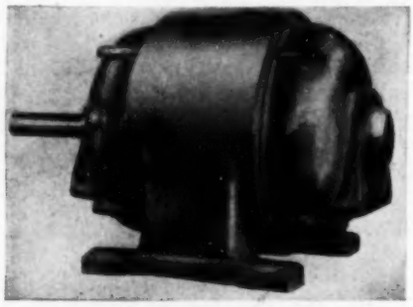


Fig. 1—Sterling Motor employing a herringbone-type rotor in sizes from 1 to 50 hp. to achieve quiet operation

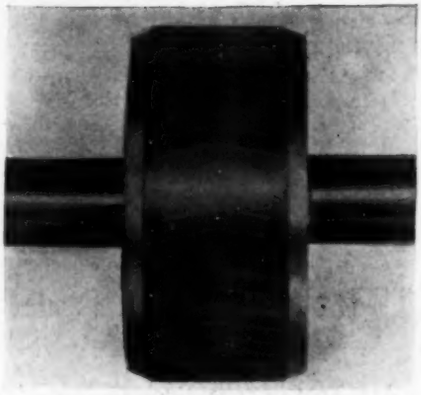


Fig. 2—Showing the herringbone slot construction of the Sterling motor

and iron losses. Mica and asbestos are built into the motor windings, minimizing the danger of breakdowns under overloads.

Niagara Automatic Drum Manufacturing Machine

Steel drum bodies of No. 16 gage, after having been rolled to cylindrical shape and welded, progress through the Niagara automatic drum manufacturing machine illustrated at the rate of five per minute. The bodies are flanged, the rolling bead expanded, the rolling bead rerolled, and corrugated. Drums are fed automatically and ejected when completed. One operator lifts the drum bodies to the feeding mechanism.

The unit has been developed by the Niagara Machine & Tool Works, 637 Northland Ave., Buffalo, N. Y. This type of machine can be used separately or in combination of two, three, or four units. When four units are set up in a line, any unit except the first or flanging unit can be stopped without stopping the feed mechanism. Drum bodies will progress through the idle units the same as if they were functioning.

The machines work on both ends of the drum body at the same time. All motions, except the rotation of the rolls, are controlled by hydraulic cylinders. Individual motors operate the rolls. Each unit has its own individual feed. The two slides carrying the upper rolls are provided with tapered pilot plates.

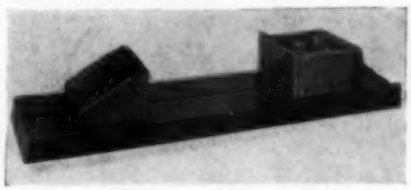
The rolling bead is produced in two operations: first, expanding; followed by a second or rerolling operation. This is necessary to obtain the high narrow rolling bead which is preferred by drum manufacturers because of its resistance to crushing. If this type of bead is not demanded, the expanding unit can be used to form a regular expanded rolling bead, or the fourth unit can be used with suitable rolls to form a rolling bead of the standard rolled dimensions.

Accessible adjustments are provided, for changing machines from one size body shell to another. Bodies from 9½ to 24 in. in diameter and 14 to 42 in. in length can be handled.

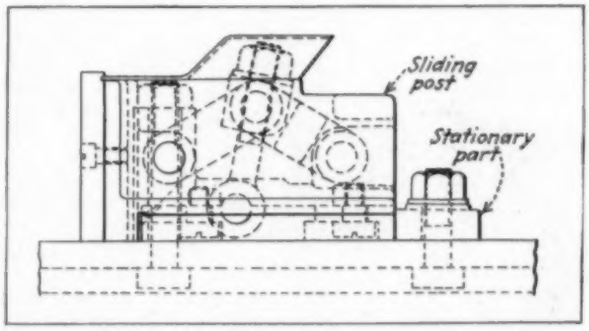
The above concern is also offering a a double-end heading unit for putting both heads into the bodies. This operation can be followed by a No. 310 horizontal, duplex, double seamer for seaming both heads to the bodies. Feeds can be regulated so that bodies pass automatically through the line.

Lindner Toggle Vises

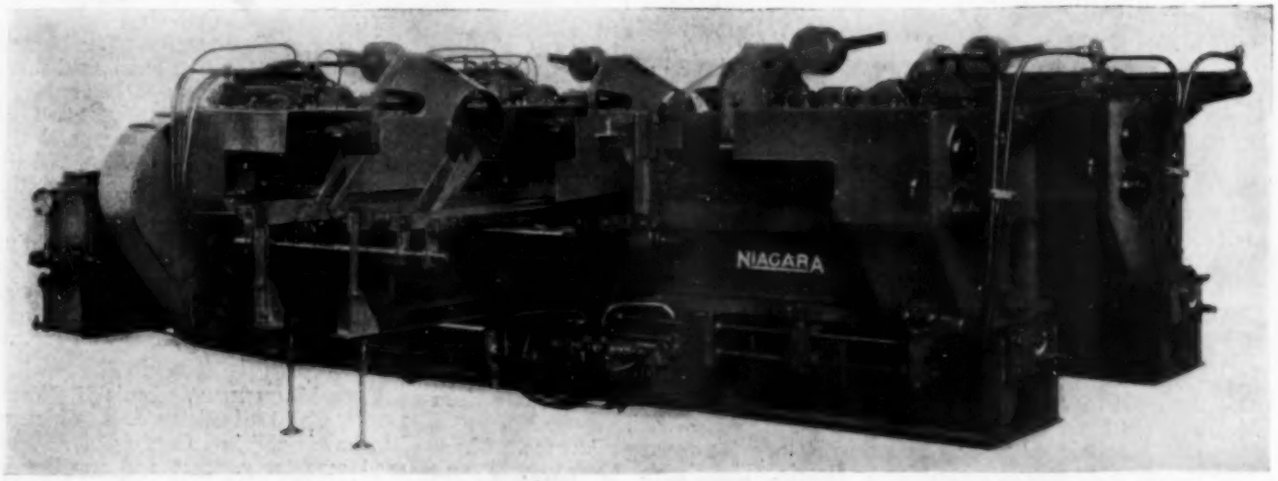
A toggle vise is being manufactured by The Linder Manufacturing Company, Wyoming Ave., Lockland, Ohio, in sizes from 4 in. wide to 20 in. wide for planer use, the jaw heights ranging from 3½ to 6 in. Standard sizes for general use are 4x3 in., 6x3½ in., and 8x4 in.



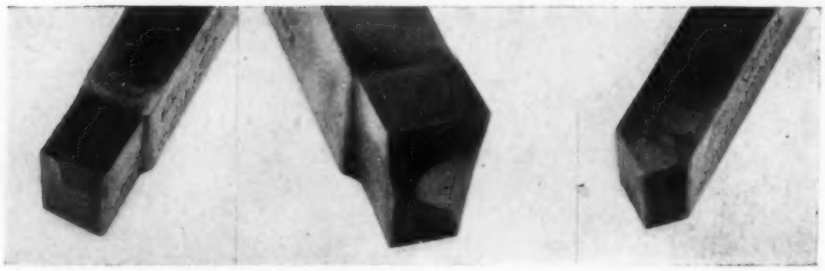
Lindner Toggle Vise mounted on a milling machine table

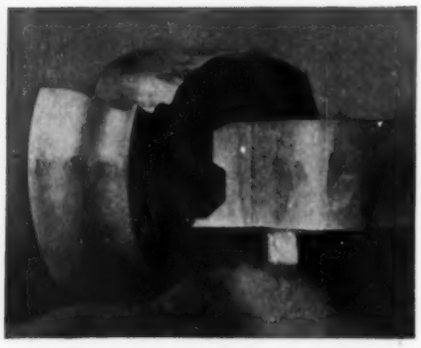


Movable portion of Lindner Toggle Vise, showing the action of the toggle to clamp this portion at any point on a milling machine table



One of four Niagara Automatic Drum Manufacturing Machines for flanging the body, expanding the rolling bead, rerolling the rolling bead, and corrugating No. 16 gage drum bodies at the rate of five per minute





Crafts Tungsten-Carbide Turning and Forming Tools

Strauss Metal (tungsten-carbide) is employed for the tips on tool bits and forming tools now manufactured by Arthur A. Crafts & Company, 125 Summer St., Boston, Mass. These tools are made by the "Castite" process of brazing. Seminole steel is used for shanks, and the tools are diamond lapped. The first illustration shows lathe tools, whereas the second shows a forming tool.

PATENTS

DECEMBER 9, 1930

Metal-Working Machinery

Arc-Welding Apparatus. Fulton Lane, Palos Verdes Estates, and Harry J. Morgan, Walnut Park, Calif., assigned to P. L. & M. Co. *Patent 1,784,015.*

Machine for Babbitting Sleeve Bearings. Carl H. Leis, New Castle, Pa., assigned to Johnson Bronze Co. *Patent 1,784,146.*

Grinding Machine. Frederic E. Gardner, Beloit, Wis. *Patent 1,784,231.*

Machine for Manufacturing Metal Chain Mail. Eugen Schofer, Pforzheim, Germany. *Patent 1,784,254.*

Multiple Drill Apparatus. Wilson P. Hunt, Moline, Ill. *Patent 1,784,288.*

Molding Machine. Wilfred Lewis, Haverford, Pa., assigned to The Tabor Manufacturing Co. *Patent 1,784,457.*

Automatic Shears. Arthur J. Townsend, Canton, Ohio and Edward S. Miller, Elyria, Ohio, assigned to The American Rolling Mill Co. *Patent 1,784,556.*

Machine for Welding. James S. Newell, St. Louis, Mo., assigned to National Lead Co. *Patent 1,784,024.*

Nut-Tapping Machine. Daniel Kelleher, Berea, Ohio, assigned to The Foote-Burt Co. *Patent 1,784,631.*

Automatic Lapping Machine. Herbert J. Willis, Niagara Falls, N. Y., assigned to The Carborundum Co. *Patent 1,784,648.*

Press for Operating Upon Sheet Material. Alfred Bredenberg, Champlain, N. Y., assigned to The Sheridan Iron Works. *Patent 1,784,721.*

Tools and Attachments

Stamped Diestock. Ralph E. Hyde, Cleveland, Ohio, assigned to The Oster Manufacturing Co., Cleveland, Ohio. *Patent 1,783,964.*

Reversible Chuck for Lathes. Charles P. Wetmore, Milwaukee, Wis., assigned to A. O. Smith Corporation. *Patent 1,783,989.*

Chuck. Albert E. Englund, West Hartford, Conn., assigned to The Jacobs Manufacturing Co. *Patent 1,784,002.*

Front Head for Pneumatic Tools. James H. Jowett, New York, N. Y., assigned to Ingersoll-Rand Co. *Patent 1,784,012.*

Setting Gauge. Gerard A. De Vlieg, Rockford, Ill. *Patent 1,784,093.*

Diestock. Ralph E. Hyde, Cleveland, Ohio, assigned to The Oster Mfg. Co. *Patent 1,784,099.*

Hopper Mechanism. Richard Lester Wilcox, Waterbury, Conn., assigned to The Waterbury Farrel Foundry and Machine Co. *Patent 1,784,124.*

Compound Mold for Casting Metal Bodies. Georg Bühler, Vienna, Austria. *Patent 1,784,174.*

Core Box. Patrick F. Devany, Chicago, Ill. *Patent 1,784,225.*

Precision Dressing Apparatus for Grinding Wheels. George Weidner, Rochester, N. Y. *Patent 1,784,261.*

Forming Die. Rowland John Curtis, Dover, Ohio, assigned to The Reeves Manufacturing Co. *Patent 1,784,579.*

Furnaces

Annealing. John R. Cain, Washington, D. C., assigned to The Richardson Co. *Patent 1,784,221.*

Rotary Tempering Furnace. Ernst Goerio, Mannheim, Germany. *Patent 1,784,427.*

Electric Furnace. Arthur Imbery Halifax, England, assigned to Globar Corporation. *Patent 1,784,670.*

Processes

Method of Cutting Slots in Metal. Clarence J. Coberly, Los Angeles, Calif., assigned to Kobe, Inc. *Patent 1,784,513.*

TRADE PUBLICATIONS

AIR TOOLS. The Buckeye Portable Tool Co., 131-135 Wayne Ave., Dayton, Ohio, now has available a catalog-booklet entitled "Speeding Production with Hercules Air Tools." This catalog No. 30 gives complete information on the various types manufactured and lists the specifications.

GEAR CATALOGS. The Boston Gear Works Sales Co., North Quincy, Mass., has issued booklets as follows: "Boston Gear Products from Stock" covering gears, speed reducers, and chain drives; "Renold-Boston Chain Drives from Stock"; "Boston Gear Speed Reducers from Stock", and "Shaft Supports from Stock."

GEARS, HERRINGBONE. The W. A. Jones Foundry & Machine Co., Chicago, Ill., has issued a 40-page booklet on herringbone cut gears, listing the various pitches in three different face widths in both cast iron and steel. These gears are cut by the Sunderland method.

LIGHTING FIXTURES. The O. C. White Co., 15-21 Hermon St., Worcester, Mass., is distributing general catalog No. 31 covering a complete line of adjustable fixtures and portables of "Daylight Units."

MOTORS, SMALL. The Westinghouse Electric & Manufacturing Co. has issued a 16-page publication, Circular 1883, covering the various types of small power motors and showing construction details.

SNAGGING EQUIPMENT. The Norton Co., Worcester, Mass., has issued three bulletins on its 16-, 24- and 30-in. snagging machines, the first two of which are swing-frame types and the third a floor-stand type. Each bulletin is very completely illustrated and the specifications are listed.

TESTING MACHINES. The Tinius Olsen Testing Machine Co., 500 North Twelfth St., Philadelphia, Pa., has issued bulletin No. 1 illustrating and describing hardness testers and instruments.

USED MACHINERY. Louis E. Emerman & Co., 1761 Elston Ave., Chicago, Ill., have published Catalog No. 30 on used machinery, tools and supplies in warehouse stock, illustrating a great many of the offerings, and giving prices.

NEWS OF THE WEEK

Industrial Machinery Exports Surpass Normal Levels

UNITED STATES exports of industrial machinery for the ten months ended October, 1930, fell short of the abnormally large volume of the 1929 period, but reached a value 12 per cent in excess of the 1928 period, 25 per cent greater than in 1927, and far ahead of any similar period since 1921, according to the Commerce Department's Industrial Machinery Division. Construction, oil-well, and metal-working machinery all showed exports for the ten months in excess of even the expanded 1929 volume.

Notwithstanding decreases during October, exports of metal-working machinery for the ten months are still substantially in excess of the 1929 record, and, by the same token, far ahead of any similar period during the past nine years. The total of $36,816,000 for the 1930 period represented a gain of nearly 8 per cent over 1929 and 37 per cent over 1928.

American metal-working lathes, especially engine and turret lathes, have been popular abroad, as indicated by shipments of engine lathes valued at $2,064,000 and turret lathes at $1,331,000, as compared with $1,749,000 and $1,183,000 for the period of 1929. Milling machines also went abroad in increased volume, amounting to $2,867,000 for the ten months, as against $2,234,000 for the corresponding months of 1929. Among these instances of unusual volume should also be mentioned sheet and plate metal-working machines, foundry and molding equipment, forging machinery, and drilling machines. The values for these items, with corresponding figures for 1929 in parentheses, are as follows: sheet and plate metal-working machines $3,651,000 ($2,800,000) foundry and molding equipment $2,926,000 ($1,637,000), forging machinery $1,699,000 ($1,235,000), and drilling machines $1,898,000 ($1,252,000).

Exports of power generating, pumping (power), textile machinery, and industrial sewing machines declined most, both for the month of October and the longer period. In the power generating group steam engine exports suffered most, while in the textile machinery group knitting machines and parts and unclassified textile and textile finishing machinery showed the largest declines. It is interesting to note, however, that exports of cotton spinning and twisting machinery and other cotton machinery (other than cotton looms) made substantial gains.

The total value of all industrial machinery exports during the 1930 period was $193,420,000, in comparison with $211,639,000 in 1929 and $172,380,000 in 1928.

Complete figures on October industrial machinery exports were given in *American Machinist* on page 912a, issue of Dec. 4.

Taylor Society Elects Officers

Henry P. Kendall, President of the Taylor Society since 1928, was re-elected president for the third successive time on Dec. 4 during the three-day International Meeting of the Society at the Hotel Pennsylvania, New York. Arthur T. Davenport was elected vice-president; Edward W. Clark, 3d treasurer; and the three new officers elected members of the board of directors. Other members of the board elected by the mail ballot and announced at the meeting were Francis Goodell, Hudson B. Hastings, and Harlow S. Person, Managing Director of the Taylor Society. Approximately 500 leaders were present at the three-day meeting, the program of which was announced in the Nov. 27 issue of *American Machinist*.

Companies Adopt Mandatory Goggle Rule

In speaking before the New York State Industrial Safety Congress at Syracuse on Dec. 3, Lewis H. Carris, Managing Director of the National Society for the Prevention of Blindness, reported that a number of companies are now applying mandatory rules regarding the wearing of goggles on specified forms of work. Included in the companies employing these rules are the Doehler Die Casting Co., Batavia, N. Y.; the Phelps Dodge Corporation, Bisbee, Ariz.; Victor American Fuel Co., Denver, Colo.; the Chapman Valve Manufacturing Co., Indian Orchard, Mass., and the Dominion Forge & Stamping Co., Walkerville, Ont. The rules adopted by these companies are similar to the one adopted by the Pullman Co. five years ago which has resulted in the elimination of high losses in hazardous occupations in that plant.

Another outstanding development of the year, according to Mr. Carris, is the great progress in standardization of design and general manufacture of goggles through a Committee of the Federal Specifications Board. Among the new methods for protecting workers suggested by Mr. Carris is that of placing an illuminated electric sign, reading "Wear Your Goggles," in the motor circuit. When the operator snaps on the switch the sign flashes directly before his eyes. Other devices reported as successful are reduction of air pressure in blowing operations for cleaning purposes, the use of castor oil for first aid in case of caustic burns of the eyes; and the attachment of a small card with the reminder, "Wear Your Goggles," to such tools as cold chisels, air drills, riveting hammers, and sledges.

Half of the Pacific Coast's largest pump, to circulate salt water through turbine cooling systems at Station "A," Pacific Gas & Electric Company, San Francisco. The casting is semi-steel, 9 ft. square by 7 ft. high, weighs 20 tons, and was built by the United Iron Works, Oakland

French Metal-Working Industry Continues Slowing Up

By Our Paris Correspondent

FRANCE, like most of the countries of the world, is on the ragged edge of economic difficulty. If it is true that potential financial resources are not lacking, it is also true that the country as a whole finds their distribution unequal. French gold balances in London are said to amount to $750,000,000, available for *possible contingencies* but probably to cover any shortage of the year's trade balances or for the import of raw materials from abroad when economic conditions dictate that the revival of industry and trade are imminent.

Comment is rife on the possible effects in French and world markets of the strenuous attempts in England, Belgium, and Germany to reduce production costs in the metal-transforming trades. It is admitted that virtually stabilized prices on raw materials and many semi-finished materials can hardly give one country or another a price advantage except from quantity production. Efforts to obtain this end have ever been the bug-bear of French industry.

For the moment, the wage scale remains in the favor of France, but this seldom shows in the finished product when it comes to export and not always in competition with imported goods in the interior market. Especially is increased competition feared with the coming of the New Year. The retail index is increasing continuously—626 in August, 637 in October—but wholesale prices are still on the toboggan, having fallen 16 points last month.

Foundries working for the automobile industry complain of a lack of decision which would enable manufacturers to book orders ahead. This is perhaps as good an indication as any other of the automobile situation at the moment, when new models have already passed their trying-out stage and only await the confidence of makers to offer them to the buying public.

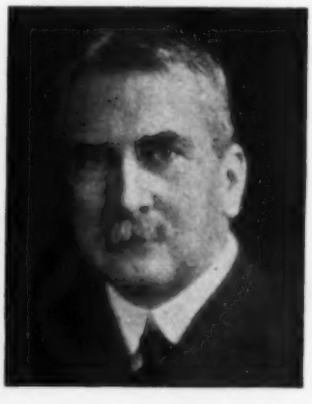
Tool and machinery production, both for metal and wood working, are said to be affected by German "dumping," a word which for the past few months has been mostly applied to Soviet Russia. In the former cases it may be ill-advised but a none too fine distinction is explainable when it is an overwhelming low price factor which is brought into play. The bright spot appears to be for the moment with the locomotive and rolling-stock industries.

French imports and exports of machine tools for the first nine months of 1928, 1929, and 1930 show variations in values which are explicable, given the applying economic conditions of the world for what they are. They do not show that French manufacturers are getting the big break abroad for which they believed they were headed. Meantime, the increase of imports is significant.

It may be taken for granted, as figures which have previously appeared will have shown, that Germany has played a fat role in these increases of imports of machine tools.

Soviet Russia has been buying heavily of tools and machinery in France. Of all exports from France to Russia 36 per cent was this year made up of such goods; a year ago it was but 15 per cent. From these figures it may be taken that Russia largely accounts for the increase of exports in these lines. Similar import and export echoes are noted with respect to figures applying to the automobile trade. From exports of 30,733 units in 1929 they have fallen to 18,381 in 1930, while imports, almost wholly from the United States and Italy, have remained stable at around 6,000 units. Exports today are about three times imports; a year ago they were six times as great.

The world's fantastic unemployment figures, as given out by the International Labor Office at Geneva, if taken with salt, may be anything from ten to twelve million. At last these are finding a more audible echo in France. The governing labor body now states that "a partial unemployment is beginning to show itself."



ADMIRAL DAVID W. TAYLOR
John Fritz Medallist

FIRST NINE MONTHS—VALUES IN FRANCS

		1928	1929	1930
Heavy machine tools, including stamping presses	Exports	4,661,000	5,165,000	7,673,000
	Imports	23,747,000	61,433,000	51,572,000
Pneumatic tools	Exports	2,159,000	936,000	2,112,000
	Imports	9,023,000	12,627,000	16,402,000
Boring machines, lathes, etc	Exports	19,907,000	18,921,000	18,273,000
	Imports	.....	147,918,000	168,000,000

HAROLD L. DOOLITTLE
A.S.M.E. Manager

Westinghouse Plans Works Improvement

Important changes and improvements at the South Philadelphia, Pa., Works of the Westinghouse Electric & Manufacturing Co., involving expenditures in excess of $300,000, have been announced from the office of the works management. As announced in last week's *American Machinist*, plans for the alterations and additions include conversion of part of the manufacturing space into a new shop, where all locomotive equipping and testing activity, in connection with Westinghouse oil-electric and electric locomotives, will be concentrated. Hitherto the work has been carried on at the East Pittsburgh Works. In addition to the conversion of one of the large machine shops as a locomotive equipping shop, the plans call for the laying of 1½ miles of additional railroad track and the construction of a 4-mile high-speed test track in conjunction with the Pennsylvania Railroad and the City of Philadelphia. Much of the locomotive business of the Westinghouse Co. has been carried on in conjunction with the Baldwin Locomotive Works, and it is believed the proximity of the South Philadelphia Westinghouse Works to the Baldwin plant will facilitate production and engineering research work between the companies.

A PROPOSED revision of Federal Specification No. 417 for Breast Drills to supersede the previous specification adopted July 9, 1926, is being submitted to industry for criticism and comment. These must be received within nine weeks in order to receive attention of the technical committee considering the subject. The specification covers two types of breast drills, plain and ratchet. The plain type drills must be of the two-speed design, have a capacity for holding drills from $\frac{1}{8}$ to $\frac{1}{2}$-in. size inclusive, either straight or tapered square shanks. Type B, or ratchet drills, are similar to the Type A drills except that the ratchet mechanism must include a suitable quick change mechanism.

BUSINESS ITEMS

The Bullard Co., Bridgeport, Conn. is celebrating its 50th anniversary. Fifty years ago Edward Payson Bullard founded what is now known as The Bullard Co. by the establishment in 1880 of The Bridgeport Machine Tool Works. In 1894 the company was incorporated as The Bullard Machine Tool Co., and the name changed to the present one in 1929.

The Chicago & Alton Railroad was sold for $23,000,000 to the Baltimore & Ohio system at public auction in Bloomington, Ill., on Dec. 11. There were no other bids.

The Polsom Manufacturing Co., Buffalo, N. Y., has been sold to the Great Lakes Pressed Steel Corporation, also with plants and offices in that city. Great Lakes will continue production of the metal specialties manufactured by the Polsom company.

William L. Batt
A.S.M.E. manager

The Chevrolet Motor Co., Detroit, Mich., a unit of the General Motors Corporation, will establish a truck body assembly plant in Jacksonville, Fla.

The Ray Machine Co., 5403 West Lake St., Chicago, has been merged with the R. G. Haskins Co., 4630 W. Fulton St., Chicago. W. H. Ray will be associated with the Haskins Company which will continue the manufacture of Ray appliances.

The Kelsey-Hayes Wheel Corporation, Detroit, is moving the machinery and equipment from the plant of the Wire Wheel Corporation, Buffalo, to the Detroit plant. Kelsey-Hayes purchased the Wire Wheel Corporation about a year ago.

The Strong, Carlisle & Hammond Co., 1300 Fort St., West Detroit, is moving to 2832 East Grand Blvd., as of Dec. 21.

The Sterling Range & Furnace Corporation, 524 Oak St., and the Fuller & Warren Co., Troy, N. Y., have been combined, and the entire production of the merged company will be from the Rochester plant, the new firm to be incorporated as the Sterling Warner Corporation.

A. Klipstein & Co., 644 Greenwich St., New York, N. Y., and its subsidiaries, will reorganize with the Kalbfleisch Corporation, a subsidiary of the American Cyanamid Co., on Jan. 1, moving its offices to 535 Fifth Ave. The business and name of the Klipstein organization will be carried on under its present management.

Petty & Wherry, Inc., 50 Church St., New York City, have been appointed distributors in the New York territory for the variable-speed transmission of the Lewellyn Manufacturing Co., Columbus, Ind.

The Industrial Plants Corporation, 25 Church St., New York City, will hold a public auction of all machinery and small tools of the Modern Experimental Machine Shop, Fourth & Hanover Sts., Pottstown, Pa., on Tuesday, Dec. 23, commencing at 12 o'clock noon. The property has been appraised at $40,000 and comprises lathes, milling machines, drills, boring mills, grinders, shapers, planers, screw machines, an assortment of hand and lathe tools, and supplementary equipment.

The Railway & Power Engineering Corporation, Ltd., 171 Eastern Ave., Toronto, Ont., will in the future manufacture and sell products of Ryan, Scully & Co., 3711 Wissahickon Ave., Philadelphia, in the Dominion of Canada.

The Savage Arms Corporation has acquired the assets of the Crescent Firearms Co., Norwich, Conn., and is to assume possession Jan. 1.

The Western Steel & Equipment Corporation, Portland, Ore., has occupied its new office and warehouse at 94 First St., corner Start St., Portland.

The Wyman Engineering Sales Co., Chamber of Commerce Bldg., Cincinnati, has taken on the agency for the Cincinnati territory of the Centrifix Corporation, 3029 Prospect Ave., Cleveland.

The New York Central Railroad has purchased the old establishment of the Hinkle Iron Works Co., on W. 55th St., New York City to add to the property required by the railroad for its new freight subway.

The Warren Pipe Corporation, Inc., of Massachusetts is building a 75x100 ft. building on a 10-acre site at South Everett. The complete factory will include a main foundry and four smaller buildings. The company is a subsidiary of the Warren Pipe Corporation of New Jersey.

National Boat Builders, Regd., has been organized in Hamilton, Ont., as a subsidiary of the National Steel Car Corporation and is building motor boats for use with outboard motors. The latter company in 1929 installed more than $1,000,000 worth of woodworking equipment. They have established the boatbuilding department in order to keep this equipment busy when it is not being used for railway car construction.

The Jones & Laughlin Steel Corporation, Pittsburgh, is adding a unit to its steel warehouse at 2250 W. 47th St., Chicago. The building will be one-story, 102x494 of all-steel construction.

Herbert L. Whittemore
A.S.M.E. manager

The Lincoln Electric Co., Cleveland, Ohio, has made a number of changes in district offices. S. H. Taylor, Jr., will succeed W. S. Stewart in charge of the Pacific Coast offices, with headquarters at 812 Mateo St., Los Angeles, Calif. Mr. Stewart has been appointed Cleveland district manager. L. P. Henderson has been appointed San Francisco office manager. E. J. Pfister, formerly of the Philadelphia and Allentown offices, has been made Kansas City district manager, with offices at 405 R. A. Long Bldg., 10th & Grand Sts., Kansas City. The Philadelphia office has been moved to the Commerce Bldg., and is in charge of D. C. Anderson.

PERSONALS

Lee E. Allen, Secretary and Chief Engineer of the Pennsylvania Engineering Works, New Castle, Pa., has been elected president of the Engineers' Society of New Castle.

Hiland G. Batcheller, Vice-President of the Ludlum Steel Co., Watervliet, N. Y., since 1919, has been made president. He is also president of the Krupp Nirosta Co., New York City, and of the Associated Alloy Steel Co., Cleveland.

Ralph M. Bowman has been appointed purchasing agent of the Republic Steel Corporation, to succeed W. J. Massman, resigned. Mr. Bowman was formerly purchasing agent for the Central Alloy Steel Corporation and more recently was buyer in charge of raw materials for Republic.

Thomas Bradshaw, President of the Massey-Harris Co. Ltd., Toronto, Ont., has resigned to devote his time to the North American Assurance Co., of which he is president. T. A. Russell, Vice-President of Massey-Harris, has been appointed acting president.

Frank Bonnievier, formerly assistant foundry foreman of Fox Furnace Co., Elyria, Ohio, has been appointed

assistant foundry superintendent of the Forest - City - Walworth - Run Foundry Co., Cleveland.

Martin Brockmann, for the past 16 years in charge of the foundry division, Cincinnati (Ohio) Milling Machine Co., has resigned his position to become superintendent of the John B. Morris Foundry Co., Cincinnati.

C. M. Burgess, President of the Burgess-Norton Manufacturing Co., Geneva, Ill., has been elected president of the National Standard Parts Association. V. W. Olsen, President of the Automatic Service Co., Minneapolis, Minn., was elected vice-president.

Stephen L. Carroll, for the past six years superintendent of foundries of the Calumet Foundry & Machine Co., East Chicago, Ind., has become associated with the alloy division of the Ohio Steel Foundry Co., Springfield. Prior to his last connection, he was foundry superintendent for the George B. Limbert Foundry, East Chicago.

George F. Clifford, 2 Belton St., Arlington, Mass., has been appointed New England representative of the Synthane Corporation, Oaks, Pa.

R. E. Coleman has been appointed manager of a new department of the General Electric Co., Schenectady, known as the Plastic Department in which all plastic activities of the company have been co-ordinated. The advisory committee for the department consists of Vice-Presidents J. G. Barry, Chairman, W. R. Burrows, and C. E. Eveleth.

Kirke W. Connor has been elected a director of the Detroit (Mich.) Forging Co., to fill the vacancy caused by the death of Andrew Bachle.

R. B. Dickson has been elected president of the Kewanee (Ill.) Boiler Corporation. Other officers include B. F. Baker, Chairman of the Board; E. F. Wagner, Secretary; and Arthur Cook, Treasurer.

Harold Davey, for several years district sales manager, Detroit, for the Empire Steel Corporation, Mansfield, Ohio, has become district manager, Detroit, for the Canton (Ohio) Tin Plate Co., of which his brother, W. H. Davey, is president. Russell Wyckoff has been named to succeed Mr. Davey as Detroit manager and will have headquarters on the 7th floor, Book Bldg.

T. E. Tillinghast
Now in charge outside engineering Pratt & Whitney Aircraft Co.

J. B. Downey, 2944 North Second St., Phoenix, Ariz., has been appointed Arizona sales representative for the Dayton-Dowd Co., Quincy, Ill.

Walter R. Emig, Factory Manager since 1926, has been elected vice-president of the Toledo (Ohio) Scale Co. Mr. Emig started with the company in the Inspection Department in the fall of 1907, being later promoted to factory supervisor, thence to factory manager. He is a past president of the National Foremen's Association.

Dr. Lillian M. Gilbreth, Manager of Gilbreth, Inc., Montclair, N. J., was the guest on Dec. 10 of the Employers' Association of Eastern Massachusetts

at its annual meeting in Boston. Mrs. Gilbreth is taking an active part in national unemployment work, being assistant to Colonel Arthur Woods, Chairman of the President's Unemployment Committee.

A. J. Foley resigned recently from the engineering department of Sargent & Lundy, Inc., Chicago, Ill., to become manager of the Chicago sales office of the Beilan Co., Ltd., Los Angeles, Calif.

Henry Ford received a gold medal for his achievements in industry and his contribution to the advancement of civilization at the annual dinner of the Illinois Manufacturers' Association at the Stevens Hotel, Chicago, on Dec. 9.

Walter F. Graham has been appointed technical director of the Caskey Brass & Bronze Works, Inc., Philadelphia, agent of the International Nickel Co. Mr. Graham wrote a number of papers on foundry practice while in charge of the Technical Division of the Ohio Brass Co. Some years ago he developed and patented Everbrite metal, a nickel-copper alloy, and in this connection served as chief metallurgist of the American Mond Nickel Co.

C. C. Handley of the Chain Belt Co., Milwaukee, spoke on "Malleable Practice" before the Quad-City Foundrymen's association at the Fort Armstrong Hotel, Rock Island, Ill., on Dec. 15.

F. D. Newbury
Now Gen. Mgr. Machinery Engrg Westinghouse Elec. & Mf_. Co.

R. W. Griswold, President of the Griswold Manufacturing Co., and W. Clay Missimer, Superintendent of the Malleable Iron Co., both of Erie, Pa., have been elected president and vice-president of the Board of Education of that city.

F. J. Haynes has been elected vice-president and a director of the H. H. Franklin Manufacturing Co., Syracuse, N. Y.

T. Hiroshima will succeed T. Usami, who has been manager of the Metal Department of Mitsui & Co., 65 Broadway, New York City, for the past four years. Mr. Usami is returning to the main office of the company in Tokyo, Japan.

H. Gardner Jackson, formerly president of the Wire Wheel Corporation of America, Buffalo, and later vice-president of the Kelsey-Hayes Wheel Corporation, Detroit, when the latter was absorbed by the Wire Wheel Co., has resigned as vice-president in charge of the Buffalo plant but will continue as a director.

F. D. Newbury, formerly manager of the Power Engineering Department, Westinghouse Electric & Manufacturing Co., has been appointed general manager of machinery engineering. Mr. Newbury has been with the Engineering Department since 1903. Succeeding Mr. Newbury as manager is R. A. McCarty, formerly division engineer in the department.

Prof. John C. Olsen, head of the Department of Chemistry and Chemical Engineering of the Polytechnic Institute of Brooklyn, Brooklyn, N. Y., was elected president of the American Institute of Chemical Engineers at its twenty-third annual meeting in New Orleans, Dec. 8-10.

S. W. Parsons has tendered his resignation as president of the Skinner Chuck Co., New Britain, Conn., and will again become associated with the Stanley Works, New Britain, on Dec. 15. He will retain his connection with the Skinner Company as a member of the board of directors. Arthur E. Thornton, Assistant Secretary of the Skinner Chuck Co., has been appointed factory manager.

Charles T. Ray, since 1924 vice-president in charge of manufacturing of B. F. Avery & Son, Louisville, Ky., has been elected president to succeed William Black, who died recently.

Robert C. Sessions, until recently engineer in charge of the engineering and experimental division of Steel & Tubes, Inc., Cleveland, has become affiliated with Frank L. Sessions, consulting engineer, with headquarters in the Rockefeller Bldg., Cleveland. They will practice consulting mechanical and electrical engineering.

Lewis K. Sillcox, Vice-President, New York Air Brake Co., has been appointed to succeed H. Birchard Taylor as one of the A.S.M.E. representatives on the Standards Council of the A.S.A. for the unexpired term ending Dec. 31, 1932. Cloyd M. Chapman has been reappointed for a term of three years ending Dec. 31, 1933, and K. H. Condit and C. B. Le Page have been designated as alternates for the ensuing year.

B. M. Tassie has been elected vice-president and general manager of Manning, Bowman & Co., Meriden, Conn., to succeed the late Reginald Tracy. Mr. Tassie was named assistant to the president in June and had been Pacific Coast manager.

Warren F. Terry has been elected secretary of the Ohio Manufacturers' Association, effective Jan. 1, 1931, to succeed Leroy B. Webster, who has resigned. Mr. Terry's headquarters will be at Columbus. L. E. Creighton has been appointed vice-president and general manager of the Union Drawn Steel Co., Beaver Falls, Pa., a subsidiary of the Republic Steel Corporation. He has been vice-president in charge of operations since 1927.

R. A. McCarty
Now Manager Power Eng. Dept. Westinghouse E. Pittsburgh Works

L. H. Van Dicke, Assistant Purchasing Agent for several years for John A. Roebling's Sons Co., Trenton, N. J., has been appointed purchasing agent to succeed the late Joseph W. Gaskill.

José Vallet, special foreign representative of the DeVilbiss Co., Toledo, Ohio, recently returned after a year and a half tour of South American and Oriental industrial centers.

OBITUARIES

Elmer J. Manning, 63, inventor and owner of a machine shop in Janesville, Wis., died on Dec. 4 there.

Anders John Anderson, 82, President of the Forest City Bit & Tool Co., Rockford, Ill., died on Nov. 30.

J. Edward Bulger, former general superintendent of the Superior Steel Corporation, Pittsburgh, died Dec. 4.

Frederick A. Hannah, 55, consulting engineer, died on Dec. 4 at his home in New York City. He recently returned from Russia.

James Brown Herreshoff, 96, inventor, died on Dec. 5 at his home in Riverdale, N. Y. He invented and constructed the first naphtha-driven motorcycle of internal combustion type in America, the coil boiler, and the fin keel for sailing yachts.

Major James M. Holloway, 63, Manager of Sales for the American Steel & Wire Co., Kansas City, Mo., died on Dec. 3.

Andrew Murray Hunt, 71, electrical and mechanical engineer, died in Berkeley, Calif., on Dec. 8. During the war he was a member of the Naval Consulting Board and also consulting engineer for war material firms.

George W. Kelly, 65, who retired about two years ago after having been superintendent of the Golden's Foundry & Machine Co., Columbus, Ga., for nearly 30 years, died recently in Macon, Ga.

Knight S. Kimich, 44, draftsman and a former mechanical engineer, died of heart disease at his home in Newburgh, N. Y., on Dec. 10. He had been with the Turl Iron & Car Co., New Windsor, N. Y., for several years.

W. M. Graddy, General Foundry Foreman, Golden's Foundry & Machine Co., Columbus, Ga., died recently at his home in that city. He had been with the company for more than 15 years.

Francis W. Lane, 72, formerly editor of "Railway Age," died on Dec. 3 at his home in Villa Park, Ill.

Samuel F. Long, 57, for the past ten years with the National Roll & Foundry Co., Avonmore, Pa., died in Pittsburgh on Dec. 4. Mr. Long was at one time connected with the Mesta Machine Co.

J. Gilbert McDonough, 54, for many years with the McDonough Manufacturing Co., Eau Claire, Wis., died on Dec. 3 after a brief illness. He was the inventor of the McDonough trademark and grade marking machine for lumber and an internal grinding machine for metal-working shops.

Charles W. Potts, 53, until recently head of the Tool and Alloy Steel Department of the Horace T. Potts & Co., Philadelphia, Pa., died on Dec. 4 in Balboa, Canal Zone. He had been on a voyage through the Panama Canal because of ill health.

Samuel J. Riley, 60, Superintendent of the Cold Metal Process Co., Youngstown, Ohio, and inventor of a heat regulator, died on Dec. 6 from injuries received in an automobile accident.

James T. Whitehead, President of the Whitehead & Kales Co., vice-president of the Kales Stamping Co., and vice-president of the Michigan Copper & Brass Co,. Detroit, died in that city on Dec. 9.

John A. Whyte, 80, at one time head mechanic of the H. J. Heinz Co., and for a long time master mechanic of the Jones & Laughlin Steel Corporation, died on Dec. 8 in Pittsburgh.

Harry W. Workman, 46, President and Manager of the Lima (Ohio) Metals Foundry Co., died on Dec. 2.

FORTHCOMING MEETINGS

Society of Automotive Engineers—Annual meeting, Detroit, Jan. 19-23, 1931. John A. C. Warner, 29 West 39th St., New York, secretary.

Fifth Midwestern Power & Engineering Conference and Exposition—Chicago, Feb. 10-14, 1931. G. E. Pfisterer, 53 West Jackson Blvd., Chicago, secretary.

Western Metal Congress and Exposition—Second National, Civic Auditorium, San Francisco, Calif., Feb. 16-20, 1931. Under auspices of A.S.S.T. W. H. Eisenman, secretary, 7016 Euclid Ave., Cleveland, Ohio.

Three-M-Congress — Management, Maintenance, and Materials Handling Congress and Second National Industrial Equipment Exposition, Cleveland, Ohio, April 13-18, 1931. In the Arena and Exhibit Hall, Cleveland Public Auditorium. Information from the A.S.M.E., 29 West 39th St., New York City.

American Society of Mechanical Engineers—Calvin W. Rice, executive secretary, Engineering Societies Bldg., 29 West 39th St., New York, N. Y. The following meetings are scheduled:

Semi-Annual meeting, Birmingham, Ala., Apr. 20-23, 1931.

National Materials Handling Meeting and Management congress, Cleveland, Ohio, Apr., 1931.

National Aeronautic Meeting, Baltimore, Md., May, 1931.

American Foundrymen's Association—Annual convention and exhibition, Stevens Hotel, Chicago, May 4-8, 1931, C. E. Hoyt, 222 West Adams St., Chicago, secretary.

American Gear Manufacturers' Association—Annual Spring Meeting, Hotel Statler, Buffalo, May 7-9, 1931. T. W. Owen, 3608 Euclid Ave., Cleveland, secretary.

THE INDUSTRIAL REVIEW

Weekly progress of the machinery and machine tool business

NEW YORK

Inquiries continue to rise. Several come from the Navy, among them a 12-in. engine lathe for Guantanamo Bay and a 15-in. x 8-ft. lathe for Charleston Navy Yard. Others include a list of 7 or 8 unit-drive used tools wanted now by a shopman near Baltimore who is shopping New York for bargains, a list of complete new equipment for the repair shop of the new Waldorf Astoria hotel, and a single from G. E. for Schenectady, a 20-in. x 6 ft. lathe to use Carboloy. Sales are also better, one dealer, for example, disposing oif two heavy-duty power bending brakes, and others a number of single units. Orders are still of the "pulling doorbells" variety, as they are expected to be until the new year has well begun. Westinghouse has purchased some 20 tools in the last 5 or 6 months for the Springfield refrigerator shop, according to report. New York subway shops, expected to be asking for tools about this time, have failed to do so. Atchison has ordered 1,500 freight cars from four companies. All-in-all, most dealers expect December to exceed November in sales totals.

MILWAUKEE

Present indications are that December business will be about on a par with November, with scattered buying by larger industries and occasional orders for small equipment. One manufacturer reports orders from manufacturers of electrical equipment. Railroads, farm implement, and automotive manufacturers are practically out of the market. Inquiries have shown some improvement, but doubt is expressed that any will materialize until after the first. In fact, some inquiries are on the basis of spring deliveries.

Numerous orders for brewery bottling machinery have been received from Mid-West, Eastern, and Southern brewing concerns, running from $15,000 to $40,000 each. This machinery can be used to bottle near beer but it is said that these breweries are buying on the possibilities of modification.

INDIANAPOLIS

While actual sales are little better than a month ago, there is considerably more optimism. For one thing, several large factories have resumed production during the last two weeks. It is assumed these factories will have to make some replacements.

A disappointing feature is the lack of demand from railroads. No important lists have been published for some time and several roads further cut employment during the last month. There is every indication of improved demand from furniture factories. One of the world's largest, located at Bloomington, already has placed a lumber order for 2,500,000 ft. and will begin production immediately. Others have announced they will resume production.

Only an ordinary demand is seen from the steel industry. Some railroads, however, have placed fairly large orders with a Huntington firm for machinery to melt snow and ice around switch points. Dealers here in used equipment say there is some demand, but the buyers want equipment without leaving the dealer any profit.

BUFFALO

The one bright spot in the situation seems to be the fact that inquiries are really beginning to come in in some volume for quotations on equipment to be delivered after the first of the year. None of the dealers are now booking any orders of any consequence for delivery this month. But within the last two weeks there has been a marked and accelerating increase of inquiries

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OPTIMISTIC NOTES are again becoming audible as the calamity chorus takes time out. One market after another, realizing that Christmas carols are more in order than tuneless renditions of the business blues, is pulling itself loose from the psychological pessimism that has held sway for several months. Inquiries, headed by several from the Navy, look more like subsequent orders, and orders are increasing slightly. Manufacturers and dealers, pinching themselves, are amazed to find December sales totals at least even, and in many cases a little ahead, of the corresponding ones for November. Price pressure is being felt, particularly in the used tool market.

NEW YORK has several inquiries from heterogeneous sources, increasing sales of the same sort, and December sales totals better. Milwaukee reports December on a par with November and real optimism expressed by brewers. Indianapolis sales are a little better as a result of increased general production, particularly among furniture and allied factories. Buffalo inquiries are up for delivery after the first. New England, stronghold of the pioneers, hesitates to admit any business pioneering.

CINCINNATI'S business car traveled along in low gear, inquiries and orders being a little stronger if anything, and one manufacturer receiving a several-tool automotive order. Chicago is facing the turn of the year optimistically, with grinding machine inquiries and sales of other tools contributing. Detroit also is planning for next year, looking hopefully toward automotive manufacturers. Philadelphia and Cleveland join in a doleful diapason, Philadelphia being quite frankly downhearted and Cleveland reporting lessened inquiries, sales of used tools, and the possibility of orders from Yoder. *American Machinist* has shown 20 per cent more new tools than usual, indicating manufacturers are busy on redesign.

CLEVELAND

There has been very little change in machine tool business in the past ten days. Orders placed were mainly for used tools. Quotations are dropping off.

About the only feature at the present time is the fact that the Yoder Manufacturing Co., recent recipient of a large order from a Youngstown steel company, is enlarging its plant and will spend a sizeable amount for machine tools.

NEW ENGLAND

The week was featureless. New England, in harmony with the rest of country, is showing consistency in low level maintenance of business. Machine tool distribution follows tenaciously the "one tool at a time" policy and the hand-to-mouth buying program. The Navy Department closed on two lists this week at Boston, however, aggregating 5 or 6 tools.

With industrial schedule gains here and there and some losses at other points the situation is spotty and very much like other weeks. Automotive inquiry has stepped up and there is real promise of orders early in the new year. As a matter of fact, there are plenty of embryo orders.

Morganmade, Inc., Keene, N. H., sold the entire equipment of its plant at an auction sale Dec. 16.

CINCINNATI

The business-car of the machine-tool manufacturers of the Cincinnati district traveled along in low-gear the past week, finding the going very hard. Little if any progress up the market-hill was made, but there was at least some satisfaction in the fact that the machine did not skid backward. Selling agents had a few scattering orders from local and adjacent territory and developed some prospects.

One fortunate manufacturer received an order for several tools from the automotive field. Orders received by others were largely confined to single tools and replacements, the buyers being miscellaneous small users. Inquiries continued at a fair level, considering general conditions, the requirements in most cases being single tools. Users seem to be "shopping around."

CHICAGO

A better and more optimistic feeling with respect to an upward turn pervades the trade. This is partially attributable to an increase in inquiries with a correspondingly more hopeful sales outlook. While it is uniformly conceded that for the remainder of 1930 there is nothing to be expected other than an occasional sale to meet an emergency or to replace an outworn unit of equipment, there is faith that shortly after the beginning of the new year there will be an upward curve on the machinery chart. Railroad inquiries additional to those noted a week ago are reported. Inquiries for grinding machines indicating an early need have been received by one local manufacturer's branch. Sales to a big Michigan industrialist during the last week is seen by one seller as an encouraging sign, and that general industry is beginning to take more interest in the machinery market. No improvement in the demand for used tools is noticeable.

DETROIT

With December sales even below the average for other months of a very poor year, machinery and machine tool dealers are making plans for renewed activity in the new year and little effort is being spent on current business.

Automobile manufacturers are still noncommittal as to their plans for the next year, and they express neither optimism nor pessimism in the matter of sales predictions. The general state of mind seems to be better.

PHILADELPHIA

No change has been noted in the situation. Dealers reported the usual scarcity of orders, with December sales so far considerably less than those for November. What few inquiries are being received come from industrial establishments, but the inquirers state frankly that they have only a subconscious notion of buying.

B·USINESS · BAROMETER

It seems fashionable to be blue though the situation does not justify it

THEODORE H. PRICE
Editor, Commerce and Finance, New York

MANY years ago it was the writer's sad privilege to go through a prison farm where the convicts worked under the supervision of mounted guards armed with rifles. It was a pathetic sight, and exemplified Dante's description of hell as "a place of abandoned hope." We had forgotten all about it until last week when we interviewed an important firm of New York stock brokers who assumed a hopelessly dolorous tone in answering our questions with regard to the future. To hear them talk one would think that the fall of the United States was only a few days off, and that every man of influence ought to record his impressions as he inhales and exhales the poisoned gas now supplied gratuitously by so many rumor-mongers.

As a matter of practical common sense the situation is one which seems to call for the services of a psychologist rather than those of a physician. The America of today is the same America that existed eighteen months ago. Then everybody was buoyantly happy because the stocks they bought were going or had gone up. Now these stocks have declined, and they cannot be exchanged for quite as many dollars as they would have brought recently. Their real value is, however, unchanged or slightly increased by the accrued but undistributed earnings that most well-managed corporations have accumulated despite the talk of hard times or extravagance.

Business reports of the week are somewhat anomalous in tone. Retail dealers are almost a unit in reporting the usual seasonal improvement in trade. Wholesalers and jobbers take a different view, and seem to be discouraged by the decline in purchasing power that their November orders show. It is not explicable except upon the theory that it is now fashionable to be blue. We have heard this remark a dozen times during the past year.

In New York the nervousness of some Wall Street financiers has been aggravated by the failure to effect the consolidation of four important banking institutions that had been regarded as *un fait accompli*, followed by the suspension of one of the banks. Financial doctors diagnosed the case favorably, but the incident has not helped to establish confidence. Had it not been for this regrettable situation an improvement in business would probably have been seen last week.

In the details of the week's commercial statistics there are but few novelties to report. Textile fabrics are a little bit slower than they were. It is expected that they will be in better demand after New Year's. In the industrial world everyone is now talking of increased efficiency, or increased production with decreased labor, and even the British labor unions have permitted some spinners to introduce patent looms experimentally. It cannot be said that stocks and bonds have advanced. It is, however, true, that the list of common stocks is being closely studied by those who have money to invest, and the number of odd lots that is being taken out of Wall Street is said to beat the record.

The talk of unemployment has partially subsided. Wall Street has decided to furnish $8,000,000 out of a much greater total that is being raised by the financial interests of the country, and a large amount of money will be available to relieve any cases of real distress. But the many appeals that come from habitual or expert beggars have put the almoners of these monies on notice, and fake appeals will not be granted.

Politically, the situation is a puzzling one. Congress and the President are not working together any more satisfactorily than had been expected. Everyone is now hopeful that a special session of the next Congress will be avoided. It is, however, a very inflammable situation. But America is *sui generis* in its command of money, and our grip upon the world's purse-strings is indicated by the consideration with which our somewhat erratic course has been accepted by the foreign powers.

If our statesmen could see that it is to their interest to open up foreign markets for our production the effect upon trade would be electrifying, and even Russia would probably figure as an enormous buyer in American markets. The letters from Russia which so many newspapers are now publishing are in fact attracting a great deal of attention, and it is quite possible that the exigencies of commerce may compel us to follow Great Britain's example in recognizing the Soviet Government. This subject is being widely discussed, and a large trade between Russia and the United States is now passing.

Taking it all in all the situation does not seem to justify the pessimism that is so widespread, and while it may be necessary for the disease to run its course, we may be nearer the end of hard times than many seem willing to admit. In situations like the present the merest trifle will sometimes strike a spark and light a fire, and those who aspire to be prescient are advised to keep their eyes open for the unexpected which may be discerned in the chapter of optimism with which the year 1931 should commence if it has the slightest encouragement.

THE BUSINESS WEEK

December 17, 1930

WEEK by week business bumps along the rocky bottom of the valley, looking forward grimly to the new year, expecting nothing more of this one, and getting it. . . . The last months of depression are the toughest, but so is business sentiment by that time, and it becomes pretty hard to disappoint it any more. . . . The general level of activity still fluctuates around the deadline, dipping again in the week ended Dec. 6 from 80.3% of normal to 77.1%. . . . Basic industrial production continues to decline, along with freight movement, while retail trade rises, all according to calendar, but hardly according to the requirements of a merry Christmas. . . . What lies beyond the turn of the year becomes no easier to see clearly. . . . Salvage crews are working hard to prop up or clear away some of the financial wreckage left by the tidal wave of deflation. . . . The wave has not altogether subsided. . . . Commodity prices not moored to government funds have been washed down a bit farther. . . . The bond market has been seriously weakened by receding investment confidence and lack of Federal Reserve support. . . . Despite the most liquid banking position in a decade, the deadly contraction of credit continues. . . . With a Congress in chaos, with the decisive international co-operative action necessary to check deflation perilously postponed, never has the need for aggressive economic statesmanship been more imperative and its absence more evident.

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THE WEEKLY PRICE GUIDE . . . .

Rise and Fall of the Market

COPPER sheets, wire, rods and tubing declined 1c. per lb. and similar fabrications of brass, ¾c., this week, at New York warehouses. Declines were also apparent in tin and babbitt metal, making the market in non-ferrous metals appear in a receding mood. Trading in pig iron is slackening on account of approaching inventory season. Aside from a small volume of orders for rails, track supplies, pipe and structurals, the steel market continues dull. Steel consumers have ceased waiting for lower prices since the recent rise of $1 per ton at mills.

(All prices as of Dec. 12, 1930)

IRON AND STEEL

PIG IRON—Per gross ton, f.o.b.:

CINCINNATI:	
No. 2 Southern (Silicon, 1.75@2.25)	$14.69@$15.19
Southern Ohio Foundry (Silicon, 175@2.25)	20.89@ 21.39
NEW YORK:	
Buffalo No. 2 Fdry. (Silicon, 1.75@2.25)	20.41@ 20.91
BIRMINGHAM:	
No. 2 Foundry (Silicon 1.75@2.25)	14.00
PHILADELPHIA:	
Eastern Pa., No. 2x (Silicon, 2.25@2.75)	18.26@ 19.26
Virginia No. 2 (Silicon, 1.75@2.25)	22.29
Basic	17.75@ 18.25
CHICAGO:	
No. 2 Foundry, Northern (Silicon, 1.75@2.25)	17.50
No. 2 Foundry, Southern	17.51
PITTSBURGH: including freight charge, $1.76, from Valley)	
No. 2 Foundry	18.76
Basic	18.76
Bessemer	19.26

IRON MACHINERY CASTINGS—Cost in cents per lb. of 100 flywheels, 6-in. face x 24-in. dia., hub not cored, good quality gray iron, weight 275 lb.:

Detroit	4.00
Cleveland	4.75
Cincinnati	4.45
New York	4 75@5.00
Chicago	4.50@4.75

SHEETS—Quotations are in cents per pound in various cities from warehouse; also the mill base in large lots:

Blue Annealed*	Pittsburgh Mill Base	Chicago	Cleveland	New York
No. 10	1.90	3.35†	3.00	3.40†
No. 12	1.95	3.45†	3.10	3.45†
No. 14	2.05	3.55†	3.20	3.50†
No. 16	2.15	3.65†	3.30	3.60†
Black				
Nos. 18 to 20	2.15@2.25	3.60†	3.40	3.70
No. 22	2.30@2.40	3.75†	3.55	3.85
No. 24	2.35@2.45	3.80†	3.60	3.90
No. 26	2.45@2.55	3.90†	3.70	4.00
No. 28	2.60@2.70	4.05†	3.85	4.15
Galvanized				
No. 10	2.20@2.30	3.65†	3.50	3.55
Nos. 12 to 14	2.30@2.40	3.75†	3.60	3.65
No. 16	2.40@2.50	3.85†	3.70	3.75
No. 18	2.55@2.65	4.00†	3.85	3.90
No. 20	2.70@2.80	4.15†	4.00	4.05
No. 22	2.75@2.85	4.20†	4.05	4.10
No. 24	2.90@3.00	4.35†	4.20	4.25
No. 26	3.15@3.25	4.60†	4.35	4.50
No. 28	3.40@3.50	4.85†	4.70	4.75

*Light Plates. †400 to 3,999 lb.

WELDED STEEL PIPE—Warehouse discounts are as follows:

	New York		Cleveland		Chicago	
	Black	Galv.	Black	Galv.	Black	Galv.
1 to 3 in. butt	56.14%	43.6%	53.3%	42.3%	57.3%	44.8%
3½ to 6 in. lap	52.72%	40.18%	50.8%	37.8%	53.9%	41.4%

WROUGHT-STEEL PIPE LIST

Size, Inches	List Price per Foot	Diameter in Inches—External	Diameter in Inches—Internal	Thickness Inches
1	$0.17	1.315	1.049	.133
1¼	.23	1.66	1.38	.14
1½	.27½	1.9	1.61	.145
2	.37	2.375	2.067	.154
2½	.58½	2.875	2.469	.203
3	.76½	3.5	3.068	.216
3½	.92	4.0	3.548	.226
4	1.09	4.5	4.026	.237
5	1.48	5.563	5.047	.258
6	1.92	6.625	6.065	.28
8	2.50	8.625	8.071	.277

SEAMLESS STEEL TUBING—Following net prices are for seamless mechanical tubing, cold drawn, round, .10 to .30 carbon, at New York warehouse in lots of less than 100 ft. or 100 lb.:

Thickness—Decimal	B.w.g. and Fractions	Outside Diameter in Inches—⅛	¼	⅜	½	1	1¼	1½
		Price per Foot						
.035"	20	$0.15	$0.16	$0.17	$0.18	$0.19	$0.21	$0.23
.049"	18	.17	.18	.19	.20	.21	.23	.25
.065"	16	.19	.20	.21	.22	.23	.25	.27
.083"	14	.20	.22	.23	.24	.25	.27	.29
.095"	13	.21	.23	.25	.26	.27	.29	.31
.109"	12	.22	.24	.26	.27	.28	.30	.32
.120" or .125"	11	.23	.25	.27	.28	.29	.31	.33
.134"	10	.24	.26	.28	.29	.30	.32	.34

MISCELLANEOUS—Warehouse base prices in cents per lb.:

	New York	Cleveland	Chicago
Spring steel, light*	4.50	4.65	4.65
Spring steel, heavier	4.00	4.00	4.00
Coppered Bessemer rods	7.00	6.00	6.15
Hoop steel	3.75†	4.00	3.75†
Cold rolled strip steel	4.95	6.00	6.10
Floor plates	4.85†	5.30	5.00†
Cold fin., round or hexagon‡	3.40	3.65	3.35
Cold fin,, flat or square‡	3.90	4.15	3.85
Structural shapes	3.10†	3.00	3.00†
Soft steel bars	3.10†	3.00	3.00†
Soft steel bar shapes	3.10†	3.00	3.00†
Soft steel bands	3.40†	3.65	3.20†
Tank plates	3.10†	3.00	3.00†
Bar iron (2.75 at mill)	3.24	3.00	3.00
Drill rod (from list)	60%	55%	50%

*Flat, ¾-in. thick by ½-in. wide. †400 to 3,999 lb., ordered and released for shipment at one time. ‡Cold finished steel, shafting and screw stock.

Electric welding wire at New York warehouse—3/32, 8.35c. per lb.; ⅛, 7.85c. per lb.; 5/32 to ½, 7.35c. per lb.

METALS

Warehouse Delivery Prices in Cents Per Lb. for Small Lots:

Copper, electrolytic, New York			12.50
Tin, Straits, pigs, New York			27.50
Lead, pigs, E. St. Louis	4.95	New York	6.00
Zinc, slabs, E. St. Louis	4.17½	New York	5.75

	New York	Cleveland	Chicago
Antimony, slabs	9.50@10.50	10.50	10.75
Copper sheets*	20.75	21.75	21.75
Copper wire*	13.25	13.37½	13.37½
Copper, drawn, round*	19.25	20.25	20.25
Copper tubing*	23.12½	24.12½	24.12½
Brass sheets, high*	17.87½	18.62½	18.62½
Brass tubing, high*	22.75	23.50	23.50
Brass rods, high*	16.12½	16.87½	16.87½
Brass wire, high*	18.37½	19.12½	19.12½

*Mill, base.

SHOP MATERIALS AND SUPPLIES

METALS—Continued

	New York	Cleveland	Chicago
Aluminum ingots, 99%†	24.00@25.00	24.30	23.30
Zinc sheets (casks)	9.75@10.25	11.25	10.36
Solder (½ and ½)	22.25	21.50	20@22

Babbitt metal, delivered in case lots, New York, cents per lb.:

Genuine, highest grade	46.00
Commercial genuine, intermediate grade	34.00
Anti-friction metal, general service	30.00
No. 4 babbitt, f.o.b.	10.00

†F.O.B.

NICKEL AND MONEL METAL—Price in cents per lb., base, f.o.b. Huntington, W. Va.:

	Nickel	Monel Metal
Sheets, full finished	52.00	42.00
Sheets, cold rolled	60.00	50.00
Strip, cold rolled	55.00	45.00
Rods, hot rolled	45.00	35.00
Rods, cold drawn	50.00	40.00
Tubing	75.00*	90.00†
Angles, hot rolled	50.00	40.00
Plates	52.00	42.00

*Seamless. †Welded.

OLD METALS—Dealers' purchasing prices in cents per pound, f.o.b. cars:

	New York	Cleveland	Chicago
Crucible copper	8.00	8.50	7.25@7.75
Copper, heavy, and wire	7.75	8.00	6.75@7.25
Copper, light, and bottoms	7.00	7.25	6.00@6.50
Heavy lead	3.75	4.00	3.00@3.50
Lead battery plates	2.00	....	....
Brass, heavy, yellow	5.00	6.50	4.00@4.50
Brass, heavy, red	7.25	9.50	6.25@6.75
Brass, light	4.00	5.50	3.50@4.00
No. 1 rod-brass turnings	5.00	5.50	4.00@4.50
Zinc	2.00	1.50	1.25@1.50

TIN PLATES—Charcoal—Bright—Per box:

"AAA" Grade:	New York	Cleveland	Chicago
IC, 14x20	$12.10	$11.95	$11.50
"A" Grade:			
IC, 14x20	9.70	9.90	9.50
Coke Plates—Primes—Per box:			
100-lb., 14x20	6.45	6.10	7.00
Terne Plates—8-lb. Coating—Small lots—Per box:			
IC, 14x20	7.75@8.00	7.00	7.50

MISCELLANEOUS

	New York	Cleveland	Chicago
Cotton waste, white, per lb.	$0.13	$0.16	$0.15
Cotton waste, colored, per lb.	.09½	.12	.10
Wiping cloths, washed, white, per lb.	.14	38.00 per M	.14½
Sal soda, per lb.	.01¾	.02	.02
Roll sulphur, per lb.	.028	.03	.04
Linseed oil, raw, in 1 to 4 bbl. lots, per lb.	.10	.104	.10
Cutting oil, about 25% lard, in 5 gal. cans, per gal.	.65	.60	.60
Machine oil, medium-bodied (55 gal. steel bbl.) per gal.	.33	.36	.24
Belting—Present discounts from list in fair quantities (½ doz. rolls) for leather or rubber:			
Leather—List price, 24c. per lin.ft., per inch of width, for single ply:			
Medium grade	30–10%	30–10%	35%
Med. grade, heavy wgt.	30%	30 –5%	30%
Rubber transmission, 6-in., 6 ply, $1.83 per lin.ft.:			
First grade	60%	50–10%	50%
Second grade	60–5%	60– 5%	50–10%

Comparative Warehouse Prices

New York	Unit	Current Price	Four Weeks Ago	One Year Ago
Soft steel bars	per lb.	$0.031	$0.031	$0.0325
Cold fin. shafting	per lb.	.034	.034	.035
Brass rods	per lb.	.16 12½	.14 87½	.2125
Solder (½ and ½)	per lb.	.2225	.2225	.295
Cotton waste, white	per lb.	.13	.13	.13
Disks, aluminum oxide mineral, cloth, No. 1 6-in. dia.	per 100	4.59	4.59	4.59
Lard cutting oil	per gal.	.65	.65	.65
Machine oil	per gal.	.33	.33	.33
Belting, leather, medium	off list	30–10%	30–10%	30–10%
Machine bolts, up to 1x30 in., full kegs	off list	65%*	65%*	50–10%*

*List prices as of April 1, 1927

MISCELLANEOUS—Continued

	New York	Cleveland	Chicago
Abrasive materials — Standard grade, in sheets 9x11 in., No. 1, per ream of 480 sheets:			
Flint paper*	$6.03	$6.03	$6.03
Emery cloth*	25.87	25.87	25.87
Disks, aluminum oxide mineral, 6 in. dia., No. 1, per 100:			
Paper†	2.61	2.61	2.61
Cloth†	4.59	4.59	4.59
Fire clay, per 100 lb. bag	.90	.75	.75
Coke, prompt furnace, per net ton	Connellsville,		2.40@2.50
Coke, prompt foundry, per net ton	Connellsville,		3.50@4.85
White lead, dry	100 lb. kegs	New York,	13.75
White lead, in oil	100 lb. kegs	New York,	13.75
Red lead, dry	100 lb. kegs	New York,	13.75
Red lead, in oil	100 lb. kegs	New York,	15.25

*Less than 3 reams. †Less than 200.

SHOP SUPPLIES

Discounts from new list dated Apr. 1, 1927, applying on immediate deliveries from warehouse stocks in New York and vicinity:

Machine bolts:	
Up to ¾-in. x 6-in., full kegs, list less	65%
Larger, up to 1 x 30-in., full kegs, list less	65%
Less than full kegs or case lots, add to list	10%
Fitting-up bolts: list less	45%
Lag screws:	
Up to ½-in. x 6-in., list less	65%
Larger, list less	65%
Less than full keg or case lots, add to list	10%
Rivets:	
Structural, round head, full kegs, net	$4.50
Structural, round head, broken kegs, net	6.00
Tank, 7/16-in. dia. and smaller, list less	65%
Nuts:	
Hot pressed, square or hexagonal, blank or tapped:	
Full kegs up to 1-in., incl., list less	65%
Larger, up to 3-in., list less	65%
Less than keg or case lots, add to list	10%
Washers:	
Wrought, full kegs, per 100 lb., list less	$4.00
Wrought, broken kegs, per 100 lb., list less	2.00
Turnbuckles:	
With stub ends, list less	20–10%
Without stub ends, list less	55%
Chain:	
Proof coil, base, per 100 lb., net	$8.50
Cast iron welding flux, per lb., net	.35
Bronzing flux, per lb., net	.50

MACHINE REQUIREMENTS AND INDUSTRIAL CONSTRUCTION

Equipment Wanted

O., Cleveland — U. S. Electric Swivel Co., W. F. Hickox, 1834 East 65th St.—small miller, small filer, 36 in. sq. shears, dial indicator.

O., Lorain — National Stove Works, subsidiary of American Stove Co., J. R. Haley, Plant Mgr.—equipment for proposed 1 story, 125 x 125 ft. enameling plant.

Tenn., Nashville—State of Tennessee—tools for shops for proposed 3 story industrial college building. Estimated cost $1,000,000.

Wis., Manitowoc—Aluminum Specialty Co.—additional stamping and miscellaneous equipment for plant additions now under construction.

Opportunities for Future Business

Ala., Birmingham — City, A. J. Hawkins, Engr., will receive bids until Dec. 22, for buildings and hangars at new municipal airport terminal. Estimated cost $125,000.

Conn., Bridgeport—Moore Special Tool Co., will not construct 35 x 70 ft. addition to plant. $15,000. Project abandoned. Noted Nov. 13.

Conn., New Haven—Todd Rubber Co., 125 Ahalley Ave., awarded contract for the construction of a 1 story garage and service station. Estimated cost $50,000.

Conn., Waterbury—Kaplan Bros., 352 East Main St., is having plans prepared for the construction of a 1 story, 60 x 115 ft. garage and sales and service station on East Main St. Estimated cost $40,000. T. M. Freney, 51 Leavenworth St., Archt.

Ill., Galesburg—Rowe Mfg. Co., manufacturers of ladders, gates and other mechanical equipment, plans to rebuild part of plant recently destroyed by fire. $60,000.

Md., Baltimore — American Cooperage Co., Fayette and Kresson Sts., will build a 1 story addition to factory for the manufacture of steel drums.

Md., Baltimore — Enterprise Wire & Iron Works, 423 North High St., plans the construction of a 1 story, 54 x 80 ft. plant at 418-22 North Colvin St.

Mass., Boston—Economy Umbrella Mfg. Co., S. Chase, 96 Essex St., plans to rebuild factory recently destroyed by fire. Estimated to exceed $40,000. Architect not selected.

Mass., Provincetown—J. H. Connolly, Depot Sq., Hyannis, awarded contract for the construction of a 1 story service garage. Estimated cost $50,000.

Mass., Wellfleet—Powdrell & Alexander, Inc., 175 Conn Mills Ave., Danielson, is having preliminary plans prepared for the construction of a 1 story factory on Main St. Ext. here. Estimated cost $40,000. W. B. Brennan, 175 Conn Mills Ave., Danielson, Engr.

Mass., West Springfield—Springfield Wire & Tinsel Co., 68 Taylor St., Springfield, awarded contract for the construction of a factory. Estimated cost $40,000.

Mich., Detroit—Bd. of Wayne County Road Commissioners, Court House, plans a 1 story, 60 x 100 ft. machine and repair shop. Estimated cost $30,000.

Mich., Jackson — Sparks - Withington Co. awarded contract for a 1 story addition to factory for the manufacture of automotive products, etc. radio equipment, etc. Estimated cost $65,000 including equipment. Noted Nov. 20.

Mo., St. Louis—Firestone Tire & Rubber Co., c/o W. G. Sabine, Local Mgr., awarded contract for a 1 story gasoline and oil service station including tire and tube department, brake relining department, etc. at Delmar St. and Hamilton Ave. Estimated cost $50,000.

Mo., St. Louis—J. W. Kopman Construction Co., 6304 South Rosebury Ave., Owner and Contractor, will build a 1 story, 150 x 332 ft. garage at Spruce St. between 15th and 16th Sts. Estimated cost $150,000. American Railway Express Co., c/o Railway Express Agency Inc., 1730 Clark Ave., lessee.

N. J., East Brunswick—Anheuser-Busch Inc., c/o A. A. Busch, Pres., 721 Pestalozzi St., St. Louis, Mo., acquired a site and plans the construction of a 7 or 8 story yeast factory including machine shop, garage, power plant, etc., here. Estimated cost $2,000,000.

N. J., East Orange—C. M. Grey Mfg. Co., 358 Central Ave., do not plan to build a die casting factory at Shepard Ave. between Nassau St. and Central Ave. $40,000. This corrects report in Dec. 4 issue.

N. J., Elizabeth—Fischer & Dackerman, 1153 Chestnut St., postponed construction of a 1 story automobile body plant on Chestnut St. Estimated cost $40,000. W. L. Finne, 1201 East Grand St., Archt. Indefinite when project will mature.

N. J., Irvington — T. J. Lee, Jr., 495 Lyons Ave., manufacturers of plumbing supplies, plans the construction of a 2 story, 50 x 200 ft. shop and storage building at 481 Lyons Ave. Estimated cost to exceed $40,000. Maturity indefinite.

N. J., Newark—Heller Tool Co., P. E. Heller, Pres., 865 Mount Prospect Ave., plans a 2 story addition to factory at Mount Prospect Ave. and Erie R.R. Estimated cost $40,000. Architect not selected.

N. Y., Brooklyn—Wheeler Holding Corp., H. A. Wheeler, Pres., Cropsey and Canal Aves., plans the construction of a factory. Estimated cost $40,000. M. Marlo, 200 Beverly Rd., Archt.

N. Y., Long Island City—D. H. Yoeman, 89-15 187th St., Hollis, plans the construction of a service garage at 54th St. and 21st Ave. Estimated cost $50,000. J. A. Boyle, 367 Fulton St., Brooklyn, Archt.

N. Y., Syracuse — Niagara Hudson Power Corp., Hiawatha Boulevard, awarded contract for the construction of a 1 story, 87 x 212 ft. garage. Estimated cost $100,000.

N. Y., Syracuse—Pierce, Butler & Pierce, 41 East 42nd St., New York, will build a boiler manufacturing plant here. Estimated cost $100,000. Work will be done by day labor and separate contracts. Noted Sept. 11.

O., Cincinnati — Railway Supply Co., 1234 Harrison Ave., awarded contract for remodeling plant.

O., Columbus — Jeffrey Mfg. Co., East First Ave., manufacturers of conveying, elevating, pulverizing, screening and other machinery and parts, awarded contract for a 2 story, 93 x 147 ft. additional to shop. Estimated cost $20,000.

O., Fostoria — American Railway Signal Co. awarded contract for rebuilding part of plant recently destroyed by fire. Estimated cost $35,000.

O., Lorain — National Stove Works, subsidiary of American Stove Co., J. R. Haley, Plant Mgr., plans the construction of a 1 story, 125 x 125 ft. enameling plant. Estimated cost $250,000. Carter-Richards Co., Engineers Bldg., Cleveland, Archts. and Engrs. Noted Dec. 4.

Pa., Oil City—National Transit Pump & Machine Co., subsidiary of National Transit Co. awarded contract for several 1 story shop buildings. Estimated cost $400,000 including equipment.

Pa., Neville Island—Davison Coke & Iron Co., Oliver Bldg., Pittsburgh, awarded contract for the construction of cement storage silos, pump and machinery building here. Estimated cost to exceed $100,000.

Pa., Pittsburgh—Bd. of County Commissioners, 519 Smithfield St., will soon award contract for excavation and foundation for a group of county airport buildings including administration building, hangars, garages, etc. Estimated cost $45,000. S. Roush, 519 Smithfield St., Archt.

Pa., Pittsburgh—Koppers Co., Koppers Bldg., plans the construction of a garage at 7th St. and Bigelow Blvd. Estimated cost $150,000. Private plans.

R. I., Auburn—Universal Winding Co. awarded contract for a 2 story addition to factory for the manufacture of textile machinery and parts. Estimated cost $40,000.

R. I., Cranston—Langelier Mfg. Co., H. K. Allard, Pres., Washington St., Arlington, plans addition to machine shop here. Estimated cost $40,000. Architect not selected.

R. I., Providence—Autocar Sales & Service Co., 302 Pearl St., is having plans prepared for the construction of a 2 story sales and service station. Estimated cost $75,000. Private plans.

R. I., Providence—E. G. Page, 225 Fountain St., is having revised plans prepared for the construction of a 2 story, 75 x 155 ft. service station. Estimated cost $75,000. F. Chiaverini, 32 Broadway, Archt. Former bids rejected. Noted Nov. 6.

Tex., Galveston—City Council, plans the construction of a municipal airport including hangars, repair shop, etc. Estimated cost $80,000. Beretta-Stiles Co., National Bank of Commerce Bldg., San Antonio, Engrs.

Tex., San Angelo—Firestone Tire Co., c/o J. B. Hallman, plans the construction of a 2 story service station at West Concho Ave. and Irving St. Estimated cost $100,000.

Va., Petersburg—State of Virginia, is having preliminary plans prepared for the construction of a 3 story industrial college. Estimated cost $1,000,000. W. R. McCornack, 10006 Carnegie Ave., Cleveland, O., is architect.

Va., Richmond — Kent Automatic Parking Garages, 350 Madison Ave., New York, N. Y., and Guarantee Finance Corp., Mutual Bldg., plan the construction of a garage, shop, service station, etc., at 9th and Franklin Sts., here. Estimated cost $400,000. M. E. Wright, American National Bank Bldg., Richmond, Archt.

Wash., Bellingham—Carson & Schanck, Inc., awarded contract for a 1 story machine shop. Estimated cost $20,000.

Wis., Kewaunee — Hamachek Machine Co., plans addition to plant to double capacity.

B. C., New Westminster—Bloedel, Stewart & Welch Ltd., plans the construction of a new shingle mill. Estimated cost $200,000.

Ont., Falconbridge — Falconbridge Nickel Mines Ltd., Concourse Bldg., Toronto, plans addition to converter smelter here. Estimated cost $50,000.

Ont., London—Hyatt Jumbo Roofing Co., 10 Aylmer St., Windsor plans the construction of a plant on Richmond St. here. Estimated cost $100,000. Private plans.

Argentina, Buenos Aires — Firestone de La Argentina, subsidiary of Firestone Tire & Rubber Co., awarded contract for the construction of a new tire manufacturing plant and power house here.

Germany, Kaiseraugst—Ford Motor Co., 3674 Schaefer Rd., Dearborn, Mich., plans the construction of a motor assembly plant in vicinity of Basel. Maturity in spring.

Yugoslavia—Ford Motor Co., 3674 Schaefer Rd., Dearborn, Mich., plans the construction of an automobile assembly plant. Estimated cost to exceed $2,000,000. Location not disclosed. Maturity indefinite.